













PROCEEDINGS  
OF THE  
ASIATIC SOCIETY OF BENGAL.

—◆—  
VOL. LX.

PART I. (HISTORY, ANTIQUITIES, &c.)

(Nos. I to III.—1891.)

EDITED BY  
THE HONORARY PHILOLOGICAL SECRETARY.

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“It will flourish, if naturalists, chemists, antiquaries, philologists, and men of science in different parts of *Asia*, will commit their observations to writing, and send them to the Asiatic Society at Calcutta. It will languish, if such communications shall be long intermitted; and it will die away, if they shall entirely cease.” SIR WM. JONES.

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CALCUTTA:  
PRINTED AT THE BAPTIST MISSION PRESS,  
AND PUBLISHED BY THE  
ASIATIC SOCIETY, 57 PARK STREET.  
1892.

The PRESIDENT announced that Lient. Petley had kindly presented to the Society the old gun containing an inscription recently dug up at False Point, a description of which was published in the Proceedings for May 1890, together with the carriage on which it has been recently mounted. The gun has been placed in the Society's grounds on the west side of the building.

The SECRETARY read a letter from the Government of Bengal conveying approval to the manner in which the Government grants-in-aid of the Oriental Publication Fund, and the Sanskrit Manuscript Fund were applied during the year 1889.

The PRESIDENT read a translation of a Sanad said to have been granted by Akbar to Heer Bijoy Suri, an Acharj of the Jains, for Girmar, Mount Abu, Parisnath, &c. It was dated 7th Ardi Bihisht or Rabi-ul-awal of the 37th year of the reign (1593). The President said that he offered no opinion about the genuineness of the document, but it certainly was in Akbar's style, as recorded by Abul Fazl. The Sanad has been produced in the case about Parisnath which is now pending on appeal before the High Court. It is said to have been first produced about 1867. The President had thought it right to notice the document because, if genuine, it was a very interesting one, and it might be lost sight of if not now referred to. Professor Bühler's paper in the *Epigraphia Indica*, Part VI, p. 321, shows Akbar's inclination towards Jainism. He is there said to have granted a firman to Jinachandra Sūri.

The PRESIDENT exhibited rubbings of an inscription of Ghiyāsu-d-dīn Balban (A. H. 664—686, A. D., 1265—1287). The inscription,\* which consists of four lines in relief, originally stood over the gateway of a dismantled fort at Manglaur in the Saharanpur district, N.-W. P., and is now placed in the Khángáh of Makhdúm Sháh Wiláyat at the same place. Manglaur is the chief town of the pargana of the same name, distant 6 miles due south from Rurki, and 16 miles south-east from Saharanpur. It is chiefly inhabited by Muhammadan *juláhas* (weavers), and is a poor place, having suffered much from fever since the water-level of the country was raised by the Ganges Canal. An imperfect copy of the inscription was sent by Mr. W. Irvine, C. S., Magistrate of the District, in February 1887, and the rubbings now produced were subsequently obtained by Dr. Hoernle.

The inscription is imperfect, and therefore difficult to read and

\* This account has been kindly drawn up by Mr. C. J. Lyall, C. I. E.

translate. The initial portion of each of the four lines, which no doubt occupied a slab to the right, is wanting, and something also appears deficient at the end of the third line. The following is the text :

الش [هشاه الاعظم غياث الدنيا والدين ابوالمظفر  
له وسلطانة في نوبة ايلة ملك ملوك الشرق والصين  
دفاعا دام علوه امر هذه العمارة الامين السهتاسه  
ح العاشر من شهر الله الاصم رجب سنة ثلاث وثمانين وستمائة

(1.) "The mighty Shahanshāh Ghiyāṣu-d-dunyā wa-d-dīn, father of the Victorious

(2.) [May God perpetuate his glory] and his rule : in the time of the governorship of the King of the Kings of the East and China

(3.) \* \* \* (May his lofty dignity be eternal !) the Shahanshāh gave the order for (the erection of) this secure building

(4.) On the tenth of the silent mouth of God, Rajab, in the year 683."

Only two other inscriptions of Balban have yet been described. One is on the walls of the Jūmi' Masjid at Garhmuktesar in the Meerath district, and is dated 682. Its text will be found at p. 136 of Mr. E. Thomas's "Pathān Kings of Delhi." In it the king is styled

السلطان الاعظم شانشاه ( read الشهشاه المعظم غياث الدنيا والدين ابوالمظفر بلبن  
السلطان ناصر امير المؤمنين

The other is the inscription on the Minār of Koil (now preserved in the Aligarh Institute, N.-W. P.) of which a facsimile and reading are given at p. 129 of the same work. The translation of a more correct reading, furnished by Mr. Blochmann, will be found at p. 486 of the late Mr. E. T. Atkinson's *Statistical Account of the Aligarh District* (Vol. II of his "Statistical, Descriptive and Historical Account of the N.-W. Provinces of India.") The latter, which is dated 10th Rajab 652, was set up during the reign of the preceding king, Nāṣiru-d-dīn Mahmūd, whose minister and brother-in-law Balban was. The Aligarh inscription also contains the curious expression, applied therein to Balban though he was then only the king's deputy (Nāibu-s-saltānah), "*maliku mulūki-sh-sharqi wa-ṣ-Ṣin*"—"King of the kings of the East and of China"—which occurs in the second line of the Manglaur inscription.\* In the latter it probably also refers, as is indicated by the words *في نوبة ايلة*,

\* This expression is used by the Arabic historians and geographers with reference to Alexander's conquests in Asia; see, e. g., Kozvini's geography (ed. Wüstenfeld) s. v. Herāt. It amounts, therefore, in an inscription like the present, to a description of the person named as "the Alexander of his age."

to a Deputy, not the king himself—perhaps to his much-loved eldest son Muhammad Sultán, called Khán-i-Shahíd, who fell fighting against the Mughals at Lahor in the following year 684. This prince was Governor of Multán during the later years of his life, but exercised authority over the whole of the western portion of the Empire during Balban's absence in Bengal in the operations against Tughrul Khán.

The word of which a fragment occurs at the beginning of the second line may be either *جلالة* or *ملكه*. The commencement of the third line is not legible without a knowledge of what comes before. The group of letters may be *دس فادام* instead of as printed above. The construction of the *امر* is faulty; we should expect *امر ببناء هذه* or *الامين - امر بهذه* is perhaps a mistake of the stone-cutter for *الامير*, but the dot of the *ن* is clear. *اعين*, as a participial adjective with a passive signification of the form *فعل*, may be appended in the masculine form to a feminine noun. The word *الشه نشاء* is doubtful. The *ز*, which is placed above the second *س*, looks more like *لا*, which, however, gives no sense. Neither of the *س* is pointed, and the *ن* seems to be written before instead of after the first *ه*. The word of which there is a fragment at the beginning of the fourth line is probably *التاريخ*, only *ع* being visible. The name *لامع*, "the deaf and dumb," given to the sacred month of Rajab is an old epithet of Arabian paganism, indicating that in that month (which stands by itself alone in the midst of the Arabian year, the other three sacred months being consecutive) the noise of battle is never heard.

The alterations in the Rules which had been proposed by Council were brought up for discussion. A letter from Rájá Rájendralála Mitra strongly objecting to the alterations was read, and then remarks were made by several members. Dr. W. King supported Rájá Rájendralála Mitra's objections, and Messrs. Mehta and Donaldson and Bábus Asutosh Mukharjia, Gaurdás Bysack, Jogendrachunder Ghose, Rajinikánta Gupta and Nobin Chundra Burál spoke against the proposals to increase the subscriptions and to substitute annual for quarterly payments. Messrs. Munro, Selater and Pedler approved of the proposal to increase the subscriptions. The alterations were then put to the vote, one by one, with the following result:

		<i>For.</i>	<i>Against</i>	<i>Result.</i>
I.	Alteration of Rule 2 (a)	1	All other present	Rejected.
II.	do. Rule 14 (c)	5	6	Rejected.
III.	do. • Rule 16	3	7	Rejected.

		<i>For.</i>	<i>Against.</i>	<i>Result.</i>
IV.	do	Rule 17 + 4	8	Rejected.
V.	do.	Rules 18, 19, 22		Rejected.
VI.	do.	Rule 24	Unanimously agreed to.	Carried.
VII.	do.	Rule 25	do.	do.
VIII.	do.	Rule 28	do.	do.
IX.	do.	Rules 32 and 35		Rejected.
X.	do.	Rule 37	First alteration rejected, second alteration whereby six months are altered into two months was carried.	
XI.	do.	Rules 38 and 39		Carried.
XII.	do.	Rules 20, 21, 26, 27, 29, 30, 31, 40		

The abolition of Rules 26 and 27 was carried.

The proposal to abolish Rules 21, 29, 31, 32 and 40 was rejected.

The President stated that the result of the voting would be reported to the Council who would consider what further steps should be taken.

The following papers were read :—

1. *On an inscription of the 7th Century A. D. relating to the reigning family of Meywar, found at Kundâ near Udaipur.* By MAHĀMAHOPĀDHYĀ KAVIRĀJA SHYAMALDĀS, M. R. A. S., F. R. H. S., (with an ink impression and photograph).

2. *Notes on some of the Muhammadan coins collected by the Afghan Boundary Commission, from an historical point of view.* By MAJOR H. G. RAVERTY. Communicated by H. BEVERIDGE, Esq., C. S.

The papers will be published in the Journal, Part I.

3. *Description of a two Cowree piece, the lowest denomination of the Hindu system of Copper Coinage.*—By W. THEOBALD, Esq. Communicated by DR. W. KING.

Among the coins dispersed lately in London, at the sale of the Da' Cunha collection was one, now in my possession, which goes far to prove the extreme minuteness of some of the copper coins, into which the unit of the whole system, the 'pana' was divided.

In the concluding chapter of General Sir A. Cunningham's 'Coins of Alexander's successors', page 18, a table is given of the subdivisions of the 'pana,' which I have reproduced, neglecting the trifling variations in weight to which copper coins are more subject than are coins of the less oxidizable metals.



In addition to the 'pana,' there are also recorded pieces of  $1\frac{1}{4}$ ,  $2\frac{1}{2}$ ,  $3\frac{3}{4}$  and 5 panas in value, the last ranging as high as 720 grains.

The 'pana' was subdivided as follows:—

Pana or 20 ganda piece	=	80 courees	=	140 grains.
$\frac{1}{2}$ " 10 " "	=	40 " "	=	70 " "
$\frac{1}{4}$ " 5 " (or 'kákini')	=	20 " "	=	35 " "
$\frac{1}{8}$ " $2\frac{1}{2}$ " ( $\frac{1}{2}$ 'kákini')	=	10 " "	=	17 5
$\frac{1}{16}$ " 2 " "	=	8 " "	=	14
$\frac{1}{32}$ " $1\frac{1}{4}$ " ( $\frac{1}{4}$ 'kákini')	=	5 " "	=	8 75
$\frac{1}{64}$ " 1 " "	=	4 " "	=	7

In this table no smaller coin is mentioned than the twentieth part of a 'pana,' of 7 grains weight and the value of four cowrees, but in General Cunningham's paper on the coins of the Nine Nāgas, in the Journal of the Asiatic Society of Bengal for 1865, page 115, reference is made to a coin of  $4\frac{1}{2}$  grains, but from the context it would appear to be a worn specimen, as it is regarded as a quarter 'kákini,' the mean weight of which is taken as 7 grains. These quarter 'kákinis' are, it may be well to remember, round coins, whose weight, especially in the smaller denominations, is less easy to adjust with accuracy, than in the case of square coins, and whose value is too trivial to render such accuracy important.

The coin now under consideration is square, quite unworn and in excellent preservation, and weighs 4·5. It is symmetrically shaped, and each side measures 0·25 of an inch. From its weight I was at first inclined to regard it as the eighth part of a kákini or the equivalent of  $2\frac{1}{2}$  courees, but Sir Alexander Cunningham, whom I consulted, is of opinion, it is rather the fortieth part of a 'pana' or two couree piece 'that division being more likely than one involving the fractional part of a couree. The highest weight of the pana is 144 grains, so that the calculated weight of  $\frac{1}{40}$  of a pana should be no more than grains 3·6 which makes the piece under consideration not quite one grain in excess, but as before remarked, in such minute pieces exactness can hardly be looked for, and the present piece is in exceptional preservation. Four pieces in Sir Alexander's cabinet from Eran weigh no more than 12 grains, ranging between 2·75 to 3·75 grains, so that it may fairly be concluded, that a two couree piece of the ideal weight of 3·6 grains was a recognised issue of the Eran and Ujain mints. The obverse displays part of two circles, which in all probability constitute a portion of the symbol of Ujain, sometimes called the 'four-balled chakra', consisting of four circles usually united by a cross. There is also a circle, or wheel, surmounted by two 'chattras' a symbol analo-

gous to the 'broad arrow' of the present day, and it does not seem that more were ever represented on the 'die' though three and seven of these 'broad arrow's or 'chattras' are more commonly represented on this symbol on the punch-marked coins, which were the prototypes of the later issues of Ujain. There is yet another symbol of two semi-circles, symmetrically united by their convex surfaces, but whether this is but a portion, owing to want of space on the die, of the common symbol of a 'chaitya' surmounted by a crescent, which is so common on punch-marked coins, or a symbol complete in itself, is not easy to say. These symbols stand out in fair relief, and the 'die' was evidently proportioned to the size of the coin. The square shape of the coin is a proof that its weight was intentionally fixed, as the weight would, it is clear, depend on the width of the 'ribbon' of copper, from which the blanks were cut, for the coin is a die struck coin, and not cast in a mould like so many of the early Buddhist coins. The reverse is blank, which seems to point to its being an early issue, after the fashion of the Elephant and Lion coins of Taxila.

### LIBRARY.

The following additions have been made to the Library since the meeting held in December last.

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*presented by the respective Societies and Editors.*

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- Dresden. Gesellschaft Iris zu Dresden,—Deutsche Entomologische Zeitschrift, Jahrgang 1889-90, Zweites Lepidopterologisches Heft, Band III, No. 1.
- Edinburgh. The Scottish Geographical Society,—Magazine, Vol. VI, Nos. 9—10.
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- . Institution of Mechanical Engineers,—Proceedings, No. 2, 1890.
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- . Royal Geographical Society,—Proceedings, Vol. IX, Nos. 9 and 10.
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- . Zoological Society of London,—Proceedings, Part 3, 1890.
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- Mendon, Ill. The American Antiquarian and Oriental Journal,—Vol. XII, No. 6.
- Mexico. La Sociedad Científica “Antonio Alzate,”—Memorias, Tome IV, Nos. 1—2.
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- . Sitzungsberichte, Mathematischphysikalischen classe, Heft III, 1889.
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- . Almanach, 1890.
- Naples. La Società Africana D' Italia,—Bollettino, Anno IX, Fasc. 7—10.
- Paris. Société Asiatique,—Journal Asiatique,—Tome, XV, No. 3.

- Paris. La Société Zoologique de France,—Bulletin, Tome. XV, No. 7.
- Philadelphia. The Journal of Comparative Medicine and Veterinary Archives, Vol. IX, No. 11.
- Shanghai. China Branch of the Royal Asiatic Society,—Journal, Vol. XXIV.
- St. Petersburg. L' Académie Impériale des Sciences de St. Pétersbourg,—Mémoires, Tome XXXVII, Nos. 8—10.
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*presented by the Authors, Translators, &c.*

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- PICO, M. PUGLISI. Consigli ai Cattivi Poeti. Poema Indostanico. 8vo. Palermo, 1891.
- RÁY, PRATÁPA CHANDRA, C. I. E. The Mahábhárata, translated into English Prose, Part LXIII. Canti Parva. 8vo. Calcutta, 1890.

### MISCELLANEOUS PRESENTATIONS.

- Griechische Münzen. Neue Beiträge und Untersuchungen von F. Imhoof-Blumer. (Abhandlungen der bayer Akademie der Wiss, 1 Cl. XVIII, Bd. III, Abth). 4to Munchen, 1890.

#### AKADEMIE DER WISSENSCHAFTEN, MUNICH.

- A Guide to the Exhibition Galleries of the department of Geology and Palæontology in the British Museum (Nat. Hist.). Part I, Fossil Mammals and Birds; Part II, Fossil Reptiles, Fishes, and Invertebrates. 8vo. London, 1890.
- Catalogue of the Birds in the British Museum, Vol XIII, Sturniformes, containing the families Artamidæ, Sturnidæ, Ploceidæ, Alaudidæ, also the families Atrichiidæ and Menuridæ. By R. Bowdler Sharpe. 8vo. London, 1890.
- . Vol. XV, Catalogue of the Passeriformes, or Perching Birds, in the collection of the British Museum. Tracheophonæ, or the families Dendrocolaptidæ, Farmicariidæ, Conopophagidæ, and Pteroptochidæ. By Philip Lutley Selater. 8vo. London, 1890.

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Catalogue of Fossil Reptilia and Amphibia in the British Museum (Nat. Hist.) Part IV. Containing the Orders Anomodontia, Ecaudata, Caudata, and Labyrinthodontia; and Supplement. By Richard Lydekker, B. A., F. G. S. 8vo. London, 1890.

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Thirty-sixth Annual Report of the Library Syndicate of the Cambridge University. 4to. Cambridge, 1890.

CAMBRIDGE UNIVERSITY.

Report on the Administration of the Central Provinces for the year 1889—90. By A. Mackenzie, C. S. I., C. S. Chief Commissioner. Fcp. Nagpur, 1890.

CHIEF COMMISSIONER, CENTRAL PROVINCES.

Report of the Colombo Museum for 1889. Fcp. Ceylon, 1890.

COLOMBO MUSEUM, CEYLON.

Resolution reviewing the Reports on the working of the Municipalities in Bengal during the year 1889—90. Fcp. Calcutta, 1890.

GOVERNMENT OF BENGAL.

Indian Antiquary, Vol. XIX, Parts 240—241 November and December, 1890. 4to. Bombay, 1890.

Land and Freshwater Mollusca of India, Supplementary to Messrs. Theobald and Hanley's Conchologia Indica. Edited by Lt. Col. H. H. Godwin-Austen. Parts I—VI, with Plates. 8vo and 4to. London, 1882-88.

GOVERNMENT OF INDIA, HOME DEPARTMENT.

Handleiding tot de Kennis der Flora van Nederlandsch Indië. Beschrijving van de families en Geslachten der Nederl. Indische Phanerogamen, door Dr. J. G. Boerlage. Eerste Deel. Dicotyledones Dialypetalæ. Tweede Stuk. Calycifloræ.—Fam XLIII, Connaraceæ.—Fam LXVI, Cornaceæ. 8vo. Leiden, 1890.

GOVERNMENT OF NETHERLANDS INDIA, BATAVIA. •

A Catalogue of Sanskrit Manuscripts existing in Oudh Provinces for the year 1888. By Paṇḍita Devi Prasāda. 8vo. Allahabad, 1890.

Report on the Horticultural Gardens, Lucknow, for the year ending 31st March 1890. Fcp. Allahabad, 1890.

• GOVERNMENT OF N.-W. P. AND OUDH.

Progress Report of the Archæological Survey, Madras, from July to September, 1890. By Mr. A. Rea. Fcp. Madras, 1890.

GOVERNMENT OF MADRAS.

Proceedings and Transactions of the Royal Society of Canada for the year 1889. Vol. VII. 4to. Montreal, 1890.

ROYAL SOCIETY OF CANADA.

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UNITED STATES GEOLOGICAL SURVEY, WASHINGTON.

Report by the Board of Managers of the Observatory of the Yale University for the year 1889-90. 8vo.

YALE UNIVERSITY.

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 ———. The Messenger of Mathematics,—Vol. XX, No. 4.  
 ———. The Nineteenth Century,—Vol. XXVIII, No. 166.  
 ———. The Numismatic Chronicle,—Vol. X, No. 39.  
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 XXXI, Part 3.  
 ———. The Quarterly Journal of pure and applied Mathematics,—  
 Vol. XXV, No. 97,  
 ———. Rhopalocera Exotica,—Part 14. October 1890.  
 ———. The Society of Arts,—Journal, Vol. XXXIX, Nos. 1983—  
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 Paris. L' Academie des Sciences,—Comptes Rendus des Séances,  
 Tome CXI, Nos. 7—15.  
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 Philadelphia. Manual of Conchology,—Vol. XII, Part 2 and Vol VI,  
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- DOBSON, G. E. A Monograph of the Insectivora, Systematic and Ana-  
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PROCEEDINGS  
OF THE  
ASIATIC SOCIETY OF BENGAL,  
FOR FEBRUARY, 1891.

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The Annual Meeting of the Asiatic Society of Bengal was held on Wednesday, the 4th February 1891, at 9 P. M.

H. BEVERIDGE, Esq., C. S., President, in the Chair.

The following members were present :

Bábú Nobinchánd Burál, W. Connan, Esq., Hon. Sir A. W. Croft, Dr. D. D. Cunningham, Bábú Saratchandra Dás, Most Rev. Dr. Paul Goethals, Bábú Rajanikánta Gupta, Colonel H. S. Jarrett, Dr. W. King, Rev. Father E. Lafont, C. Little, Esq., C. J. Lyall, Esq., Kumár Rameswár Maliáh, Bábú Asutosh Mukopádhyáy, L. de Nicéville, Esq., J. D. Nimmo, Esq., M. H. Oung, Esq., Hon. Dr. Mahendralál Sarkár, W. L. Slater, Esq., Pandit Haráprasád Shástri, C. H. Tawney, Esq., Dr. J. H. Tull Walsh, Colonel J. Waterhouse, J. Wood-Mason, Esq.

According to the Bye-Laws of the Society, the President ordered the Voting papers to be distributed for the election of Office-Bearers and Members of Council for 1891, and appointed Messrs. de Nicéville and Donaldson to be Scrutineers.

The PRESIDENT then called upon the Secretary to read the Annual Report.

ANNUAL REPORT FOR 1890.

The Council of the Asiatic Society have the honor to submit the following report on the state and progress of the Society's affairs during the past year.



### Member List.

During the year under review 23 Ordinary Members were elected, 14 withdrew, 5 died, and 8 were removed from the list under Rule 40, being more than 3 years absent from India; of the 23 Members elected 3 were old Members who rejoined. The total number of Members at the close of 1890 was thus 303 against 307 at the end of the preceding year; of these 105 were Resident, 142 Non-Resident, 10 Foreign, 21 Life, 23 absent from India and 2 special Non-Subscribing Members, as will be seen from the following table, which also shows the fluctuations in the number of Ordinary Members during the past six years.

Year.	Paying.				Non-Paying.				Grand Total.
	Resident.	Non-Resident.	Foreign.	Total.	Life.	Absent.	Special Non-Subscribing.	Total.	
1885	105	161	13	279	16	34	1	51	320
1886	93	142	18	253	16	48	2	66	319
1887	98	137	15	250	17	44	2	63	313
1888	98	136	15	249	20	34	2	56	305
1889	108	135	13	256	22	27	2	51	307
1890	105	140	10	255	21	25	2	48	303

The five Ordinary Members the loss of whom by death during the year we have to regret, were Kumār Isvariprasād Garga, Dr. N. K. Roy, Mr. Alexander Grant (Life Member), Mr. E. F. T. Atkinson, and Mr. S. A. Hill.

There were no deaths amongst the Special Honorary Centenary Members, and only one amongst the Honorary Members; *viz.*, Professor Bāpu Deva Sāstri, C. I. E., of Benares. Their numbers now stand at 5 and 24 respectively; being one below the normal strength.

The Corresponding Members and Associate Members remain at 7 and 8 respectively, as last year, there having been no casualties.

No Members compounded for their subscription during the year.

### Indian Museum.

No presentations were made over to the Indian Museum.

There was only one change amongst the Trustees, caused by the resignation of Mr. E. Gay in consequence of leaving India, Mr. H. Beveridge was appointed to fill the vacant place.

The other Trustees on behalf of the Society were—

Dr. A. F. R. Hoernle.

A. Pedler, Esq.

Dr. D. D. Cunningham.

C. Little, Esq.

#### Finance.

\* The accounts of the Society are shown in Statement No. 1 in the appendix under the usual heads.

Statement No. 8 contains the Balance Sheet of the Society, and of the different funds administered through it.

The Budget Estimate for 1890 was taken at the following figures—Receipts Rs. 13,900, Expenditure Rs. 13,840. The actual results were, Receipts Rs. 18,758 and Expenditure Rs. 21,239.

The increase in Receipts is under the heads of Subscriptions, Sales of Publications, and Interest. *Subscriptions* were estimated at Rs. 7,340, whilst the actuals were Rs. 7,740, the excess being due to the Government Subscription to the Society's publications having been realized for the two years 1889 and 1890. *Sales of Publications* show an increase of Rs. 867, owing to receipts from the sale of the extra number of the Journal, Part I, containing Mr. Grierson's "Modern Vernacular Literature of Hindustan." This was expected when the estimate was prepared, as explained in the Report for last year, but no change was made in the estimate, it not being possible to anticipate what the amount might be. *Interest on Investments* was estimated at Rs. 6,100, the actuals have been Rs. 9,349. The large increase of Rs. 3,249 has arisen from the transfer in July last of Rs. 1,20,000 of the "Permanent Reserve Fund" from the  $4\frac{1}{2}$  per cent. to the 4 per cent. loan, the Government having paid in advance the excess interest of  $\frac{1}{2}$  per cent. to September 1893 (when the loan matures), to induce holders to make the transfer; and to interest for three months having been received at 4 per cent. the payments of interest now falling due in the months of June and December, whereas under the former loan they were due in March and September.

• There is also a new receipt of Rs. 300 from the Photographic Society for rent of the two rooms they occupy in the Society's building.

The expenditure has exceeded the estimate by the large sum of Rs. 7,399, of which Rs. 6,723 is on account of the Journal and Proceedings. This is due partly to the payment of Rs. 1,402 for printing Mr. Grierson's book on the "Modern Vernacular Literature of Hindustan," forming an extra number to the Journal, Part I for 1888, and partly to excess payment of Rs. 4,100 on account of the Journal, Part II, caused by the adjustment of £177 for plates charged in Trübner's account for

1888, which only came to hand in December last, and to larger payments for printing, owing to some of the Baptist Mission Press bills for 1889 not having been paid in that year. The Proceedings also show an increase of Rs. 1,150 from the same cause.

The actual expenditure on the Journal and Proceedings was as follows :—

Journal	{ Part I.—Rs.	3,206
	{ Part II.— „	6,364
Proceedings.—	„	2,053
Total Rs.		11,623

against a budget provision of Rs. 4,900. There is still a sum of £48 due to Messrs. Trübner for plates for Part II supplied in 1889, which will be adjusted on receipt of their accounts for that year.

The other items of increase are of small amount, being Rs. 279 for Books. Rs. 193 for carrying out alterations in the drainage under a notice from the Municipality. Rs. 122 for printing Circulars and forms, Rs. 66 for printing the Catalogue of Tibetan Xylographs, and Rs. 35 for purchasing a copper-plate; particulars of the plate were given in the Proceedings for December 1890.

The budget estimate for the present year has been fixed as follows. Receipts Rs. 15,570. Expenditure Rs. 14,323. On the receipt side the estimate for *Subscriptions* has been raised to Rs. 7,500, in consequence of the rates of subscription to the Journal and Proceedings having been brought back to those which obtained prior to 1886, when they were lowered in the hope of causing an increase of sales. There will be the full receipt of Rs. 720 this year for rent of the two rooms occupied by the Photographic Society, and also a new item for *Admission Fees*, which has been taken at Rs. 700, these are now to be treated as Ordinary income instead of being added to the "Reserve Fund." *Miscellaneous* has been increased by Rs. 800 in expectation of a refund of Income Tax erroneously deducted in past years from the interest on the Government Securities belonging to the Society, the Collector of Income Tax having granted a certificate that it is not liable to assessment under the Income Tax Act. The head of *Interest on Investments* has been taken on the amount now held in securities, but there will be an increase if the proposal to invest a portion of the Funds in Municipal or other Debentures bearing a higher rate of interest is carried out.

On the expenditure side the changes in last year's estimate are small. *Postage* has been increased by Rs. 100, in consequence of the Society's publications being now sent to Mofussil and Foreign Members, and

Societies &c. immediately on publication, instead of quarterly, as formerly. A small increase of Rs. 200 has been made for *Books*, and of Rs. 200 for the *Journal*. The other heads remain unaffected. No provision has been made for *Auditors Fee*, as it is proposed to revert to the former practice of having the accounts audited by two Members of the Society.

This is in accordance with rule 58 (h).

The details of the Budget Estimate are as follows :—

#### RECEIPTS.

Subscriptions	...	...	Rs.	7,500	0	0
Sale of Publications	...	...	...	400	0	0
Interest on Investments	...	...	...	5,388	0	0
Rent of rooms	...	...	...	720	0	0
Admission Fees	...	...	...	700	0	0
Miscellaneous	...	...	...	862	0	0
Total Rs.				15,570	0	0

#### EXPENDITURE.

Salaries	...	...	Rs.	4,390	0	0
Commission	...	...	...	400	0	0
Stationery	...	...	...	100	0	0
Lighting	...	...	...	80	0	0
Petty Repairs	...	...	...	10	0	0
Municipal Taxes	...	...	...	819	0	0
Postage	...	...	...	700	0	0
Freight	...	...	...	10	0	0
Meeting	...	...	...	83	0	0
Contingencies	...	...	...	150	0	0
Books	...	...	...	1,800	0	0
Local Periodicals	...	...	...	31	0	0
Binding	...	...	...	450	0	0
Journal, Part I	}	...	...	4,200	0	0
Journal, Part II		...	...			
Proceedings	...	...	...	1,000	0	0
Printing Circulars, &c.	...	...	...	100	0	0
Total Rs.				14,823	0	0

#### London Agency.

Messrs. Trübner's statement of account with the Society for 1888, which has been so long overdue, was received just before the close of

the year. The only reason assigned for the great delay was, that it had evidently been sent and miscarried. The statement shows a debit balance of £369-6-4, of which £109-19-7, the balance of account for 1887, was remitted in April 1889, leaving a net debit balance of £259-6-9 on the transactions of the year.

The sales of the Society's publications effected by Messrs Trübner in 1888 amounted to £24-5-0 and of the Bibliotheca Indica to £16-13-0.

The number of copies of parts of the Journal, of the Proceedings, and of the Bibliotheca Indica sent to the Agents during 1890 for sale was 799, 450 and 1307 respectively, valued at Rs. 1,650.

Nine invoices of books purchased, and of publications of various Societies sent in exchange, were received during the year. The value of the books purchased amounted to £80-14-6.

A further remittance of £100 was made to Messrs. Trübner early in the year towards their accounts for 1888. Their accounts for 1889, have not yet been received.

### Library.

The total number of volumes, or parts of volumes, added to the Library during the year was 2,168, of which 747 were purchased, and 1,421 presented or received in exchange for the Society's publications.

The first fasciculus of the Catalogue of the Persian works in the Oriental Library has been published; the remaining portion of the work is in the press and expected to be ready very shortly.

### Publications.

There were published during the year, ten numbers of the Proceedings containing 268 pages of letter press and 3 plates; four numbers of the Journal, Part I, (Nos. 3 and 4 of 1889 and Nos. 1 and 2 of 1890) containing 325 pages of letter press and 13 plates; and three numbers of the Journal, Part II containing 270 pages of letter press and 8 plates. Two numbers of the late Mr. Atkinson's Catalogue of the Insecta of the Oriental Region containing 325 pages of letter press were also issued as a Supplement to Part II; and the indexes to the Journal for 1888 and 1889, the latter containing two plates belonging to the Journal for that year.

### Building.

An unforeseen expenditure of Rs. 193-5-9 had to be incurred in carrying out certain alterations in the drainage of the grounds connecting with the sewer, consequent on a notice from the Municipality. The approval of the Municipality was obtained to the estimate for the work, as also to the manner in which it had been carried out.

### Coin Cabinet.

During the year 87 coins were added to the Cabinet, of which 2 were of gold, 21 of silver, and 64 of copper. One of the gold coins was presented by the Govt. N.-W. Provinces, all the rest were acquired under the Treasure Trove Act, and were from the Bengal Presidency. They all belong to ordinary types and detailed notices of them have been given in the Proceedings for May, June and July.

### Office of the Secretaries.

Dr. Hoernle carried on the duties of Philological Secretary until June, when he went on leave and Major Sadler took them up until September when he left Calcutta temporarily and made them over to Dr. Solf, who carried them on until the middle of December, when he was obliged to leave India owing to ill health. Mr. Tawney has agreed to carry on the work till Dr. Hoernle's return.

Mr. Wood-Mason resigned the editorship of the Journal, Part II in June and Mr. Sclater was appointed Natural History Secretary and editor. He went on short leave in September, and Col. Waterhouse took charge of the Journal during the interval.

Dr. W. King carried on the duties of Treasurer during the year except for two periods of about two months each, when he had to leave Calcutta on duty, and Mr. Sclater took charge of the work.

Mr. H. Ronaldson was Assistant-Secretary throughout the year.

Mr. J. H. Elliott rejoined his post of Assistant-Librarian on the expiry of his leave in March. There were no changes in the posts of Cashier, Pandit and Copyist, which were held by the permanent incumbents Bábu Nritya Gopal Bose, Pandit Hari Mohan Vidyábhúshan and Bábu Joges Chandra Chatterjee respectively.

### Bibliotheca Indica.

Forty-five fasciculi were published during the year, of which twelve were in the Arabic-Persian, twenty-seven in the Sanskrit, and six in the Tibetan series. They belong to twenty-one different works, of which three are in the Arabic-Persian, fifteen in the Sanskrit, and three in the Tibetan series. There was one new publication in each series, viz., the *Riyāzu-s-Salātín*, in the first series, the *Nyāyavindu Tíkā* (complete in one fasciculus) in the second, and the *Pag Sam Thi sin* in the third. Six works were completed of previous years, of which two, the *Tárikh-i-Firúz Sháhí*, and the *Riyāzu-s-Salātín*, belong to the Arabic-Persian, and the *Advaita Brahma Siddhi*, the *Kurma Purāna*, the *Manu Tíkā Sangraha*, and the *Uvāsagadasáo* to the Sanskrit series.

It was stated in the Annual Report for 1890 (p. 22) that 44 fasci-

culi had been estimated as the out-turn for the year at a probable amount of Rs. 16,588 : the actual out-turn has been 45 fasciculi, as stated above. The expenditure out of the Oriental Publication Fund during the year amounted to Rs. 15,206 which includes printing charges for 38 fasciculi, and editing charges for 28 fasciculi, and gives an average of Rs. 460 for each fasciculus. For the year 1891 the out-turn may be reckoned at 36 fasciculi.

No new works were sanctioned for publication during the year : On the other hand it has been decided not to publish the translation of the *Riyāzu-s-Salātīn*, which was sanctioned in 1887, and to discontinue the translation of the *Tuzuk-i-Jahāngīrī*, of which one fasciculus has been published.

The translation of the second volume of the *Āin-i-Akbarī*, which was mentioned in the report for 1887 to have been taken up by Colonel Jarrett, has been well advanced, and is expected to be completed in the present year.

Of the following works of which fasciculi had appeared in previous years, no fasciculi were published during the year under review.

1. TABAQĀT-I-NĀSIRĪ, (Index of persons and places) ; 2, PRĀKRĪTA LAKṢHAṆA (English translation and Notes) ; 3, KĀTANTRA (introduction) ; 4, SŪSŪTA SAMHITĀ (English translation) ; 5, ĀPASTAMBA ŚRAUTA SŪTRA (Text) ; 6, LALITA VISTARA (English translation).

Of the following works sanctioned in previous years, no fasciculi have as yet appeared.

1. PRĀKRĪTĀDHYĀYA (Text and translation) ; 2, CHARAKA (English translation, with Notes) ; 3, NAQAID-UL-FARAZDAQ-JERIR (Text with English translations in prose and verse) ; 4, KĀLA VIVEKA (Text) ; 5, VEDĀNTA SŪTRA, Commentaries on, (Text) ; (two of these, *viz.*, ANUBHĀSHYAM and ŚRĪBHĀSHYAM, have been commenced) ; 6, YOGINĪ TANTRA (Text) ; 7, KARĀṆA GRANṬHA (Text) ; 8, MUNTAKHABU-T-TAWARĪKH, Vol. I, (English translation) ; 9, TĀJ-UL-MĀĀSIR (Text) ; 10, TĀRĪKH-I-WASSAF (Text) ; 11, TĀRĪKH-I-YĀMINĪ (English translation, with Notes) ; 12, JŪNĀTĀDHARMAKATHĀ and VIPĀKA SŪTRA (Text) ; 13, SADDHARMA PUṆḌARĪKA (Text) ; 14, AL TABRĪZĪ's Commentary (Text) ; 15, SVAYAMBHŪ PURĀṆA (Text) ; 16, BAUDHĀYANĪYA ŚRAUTA SŪTRA, and HIRANYAKESĪ ŚRAUTA SŪTRA (Text) ; 17, ĀIN-I-AKBARĪ, Vol. II, (English translation) ; 18, RIYĀZU-S-SALĀTĪN (Text and English translation) ; 19, BHATṬOTPALA's Commentary on VARĀHA MIHIRA's BRIHAT SAMHITĀ. •

No new works were sanctioned for publication during the year.

The following is a descriptive list of the publications issued during 1890.

### A. Arabic and Persian Series.

1. MA'ĀSÚRU-L-UMARÁ or memoirs of the nobles of the Mughal Court of Delhi by a nobleman of that Court, compiled during the early part of the last century. It contains biographical accounts of those great men who worked hard for the establishment and the consolidation of the Mughal empire in India. Nos. 740, 750, 751, 756, 762, 769, 778. Vol. II, Fasc. 9, Vol. III, Fasc. 1, 2, 3, 4, 5, 6. Total, seven Fasc.

2. RIVÁZU-S-SALÁTÍN, by Ghulám Husain, called Salím, a native of Zaidpur. It is a history of Bengal to which is prefixed a short geography of Bengal. The work of editing and translating the work was entrusted to Maulvi Abdul Hak Abid, B. A., but the translation has been abandoned for the present. Nos. 755, 764, 771, 775, Fasc. 1, 2, 3, 4. Total four Fasc.

3. TARÍKH-I-FIRÚZ SHÁHÍ, a history of the reign of Fírúz Sháh Tughlaq of the Tughlaq dynasty of Delhi by Shams-i-Siráj-i-'Afif, has advanced by one fasciculus only, No. 738, Fasc. 5. There is another work on the same subject by Ziyá-i-Baraní.

### B. Sanskrit Series.

1. ADVAITA-BRAHMA-SIDDHI by Sadánanda Yati has been completed. It contains four chapters designated "blows with a club." It refutes the various philosophical doctrines that obtained currency in ancient India and establishes the non-dual theory. The *Vedānta Dīpā*, a short work on the Vedānta philosophy, in verse, has been added to the work as an appendix. The editor Paṇḍit Váman Sāstrí, Upādhyāya of Islāmpur in Bombay, has added a very large number of foot-notes which have the rare merit of really elucidating the text, No. 747. Fasc. 4. Total one Fasc.

2. BRĪHAD-DEVATÁ, a very ancient work attributed to Śaunaka Achārya. It is an index to the Rīg Veda giving the *devatá*, the deity praised, i. e., the subject-matter of every *sūkta*, and *rich* of that Veda. It is one of those works which enabled the ancient *ṛishis* to preserve the purity of the Vedic text. Edited by Rájá Rájendralála Mitra, LL. D., C. I. E. The work has advanced by one fasciculus only. No. 760, Fasc. 2.

3. CHATURVARGA CHINTÁMAṆÍ is an exhaustive work on Hindu rituals by Hemádri the Court Paṇḍit of one of the Yádava kings of Devagiri during the thirteenth century. The author is reported to have been a great friend of Vopadava, the celebrated author of the *Mughha-*



bodha. Two volumes of the work have been completed and the first part of the third volume. The Editors, Paṇḍits Jogeśvara Smṛitiratna and Kāmākhyānātha Tarkavāgīśa are now engaged with the second part of the third volume which relates to the *Sṛddha* ceremony. Nos. 746, 763, 774, Vol. III, Pt. II, Fasc. 5, 6, 7. Total *three* Fasc.

4. KŪRMA PURĀṆA, edited by Babu Nīlmaṇi Mukhopādhyāya, Professor of Sanskrit, Presidency College, Calcutta, has been completed. It contains a learned preface by the editor in which the character and nature of the Puranic literature has been fully discussed. No. 743, Fasc. 9. Total *one* Fasc.

5. MADANA PĀRIJĀTA, written under the patronage of Madana Pāla Deva of Kāshthā or Kachchhā a city near Delhi on the Jamunā. Madana Pāla was a great patron of learning and a large medical work was also compiled under his patronage. The Pārijāta quotes from the Chaturvarga Chintāmaṇi and the Mitāksharā and appears to have been written about the fifteenth century. It has advanced by two fasciculi. Nos. 757, 770, Fasc. 7, 8.

6. MANU-ṬĪKĀ SAMGRAHA, edited by Dr. Julius Jolly, Professor of Sanskrit, Würzburg, contains extracts from six of the well-known commentaries of Manu. These extracts are meant simply to explain the texts of the original, all additional matter and arguments having been excluded. The work has advanced by one fasciculus, which brings the extracts to the end of the third chapter of Manu. It has now been stopped by agreement with the editor, owing to the publication of all the Manu commentaries by the late lamented Rao Vishvanāth Maṇḍalik. No. 728, Fasc. 3. Total *one* Fasc.

7. NYĀYA-VINDU ṬĪKĀ, a commentary to the Nyāya-vindu. A work on the Buddhist system of logic, edited by Professor Peter Peterson, M. A., of Bombay. It is a solitary example of a Buddhist work preserved in the Continent of India in a Jaina Library. The learned editor has succeeded during the course of his edition in getting a copy of the original work, the Nyāya-vindu. The present commentary is by Dharmottarāchārya who is reputed to be the founder of the Dharmotariya school of the followers of Buddha. The learned editor is now engaged in making a translation of both the text and the commentary. No. 741, complete in one Fasc.

8. NYĀYA KUSUMĀNJALI PRAKARAṆAM by Udayanāchārya. This work is to be distinguished from the metrical work of the same name by the same author, edited some time ago by E. B. Cowell, Esq. The edition is in the hands of Mahāmahopādhyāya Chandrakānta Tarkā-lankāra. It is accompanied with the commentary of Varddhamāna, copiously illustrated by extracts from the gloss of Rūchidatta. It has

advanced by four fasciculi. Nos. 745, 749, 765, 768. Vol. IV, V, VI and Vol. II, Fasc. I.

9. PARÁŚARA SMṚITI by the same learned editor, has advanced by three fasciculi, two belonging to the second volume treating of *Práyaśchitta*, and one to the third volume treating of *Vyavahāra*. The work is accompanied with the commentary of the great Mādhavāchārya and is the standard work on Hindu Law and Rituals in Southern India. Nos. 759, 761, 766, Vol. II, Fasc. 3, 4, Vol. III, Fasc. 1. Total *three* Fasc.

10. SĀMKHĀYANA ŚRAUTA SŪTRA edited by Dr. Alfred Hillebrandt, Professor of Sanskrit in the University of Breslau. The second volume has advanced by one fasciculus. This volume contains the commentary by Anarttiya, the son of Varadatta, on the text of Sāmkhāyana. No. 754, Vol. II, Fasc. 2. Total *one* Fasc.

11. ŚRĪ-BHĀSHYAM edited by Paṇḍit Rāmnāth Tarkaratna is a commentary on the Vedānta aphorisms of Vādarāyaṇa by Rāmānujāchārya, the founder of a Vaishnava sect in Southern India who flourished about the thirteenth century A. D. This commentary adopts the non-dual theory of Śamkara with certain modifications. No. 737, Fasc. 2. Total *one* Fasc.

12. TAITTIRĪYA SAMHITĀ edited by Mahāmahopādhyāya Maheśa-chandra Nyāyaratna, C. I. E., has advanced by one fasciculus. It is the text of the Black Yajur Veda and is accompanied with the commentary of Mādhavāchārya. No. 744, Fasc. XXIV. Total *one* Fasc.

13. TATTVA-CHINTĀMAṆI, edited by Paṇḍit Kāmākhyānātha Tarkavāgīśa, has advanced by four fasciculi. The editor is now going on with the second volume of the work which treats of Inference. Nos. 735, 748, 758, 772, Vol. II, Fasc. 3, 4, 5, 6. Total *four* Fasc.

14. TULSĪ SATSĀI, i. e., seven hundred verses by Tulsīdās the great Hindi poet. Each verse contains a riddle and a double entendre, one meaning of which is a praise of Rāma. The work is being edited by Paṇḍit Bihārīlāl Chaube. It has advanced by two fasciculi. Nos. 739, 753, Fasc. 2, 3.

15. UVĀSAGADASĀO edited by Dr. A. F. R. Hoernle. With this fasciculus which contains indices the work is now completed. No. 752, Fasc. 6. Total *one* Fasc.

#### C. Tibetan Series.

1. SHER PHYIN edited by Bābū Pratāpa Chandra Ghosha is a Tibetan translation of the Sata Sāhasrikā Prajñā Pāramitā or the Prajñā Pāramitā of 100,000 verses. The learned editor is omitting all repetitions which abound in the work. Nos. 736, 742, 767, Vol. I, Fasc. 4, 5, and Vol. II, Fasc. 1. Total *three* Fasc.

2. BODHISATTVAVADĀNA KALPALATĀ, by Kshemendra, under the

joint editorship of Bábú Sarat Chandra Dás, C. I. E., and Paṇḍit Hari-mohan Vidyábhúshan, Oriental Librarian to the Asiatic Society, has advanced by two fasciculi. The work is accompanied with a Tibetan translation made about 400 years ago at Lhásá. Nos. 773 and 777, Vol. I, Fasc. 3, Vol. II, Fasc. 1. Total *two* Fasc.

3. PUG SAM THI SIN is a free prose rendering in modern Tibetan of the above work as distinguished from the metrical and literal version in classical Tibetan given in No. 2. Pug Sam Thi Sin is recited daily almost in every household in Tibet. No. 776, Fasc. 1. Total *one* Fasc.

*List of all Societies, Institutions, &c., to which the Publications of the Asiatic Society have been sent during the year, or from which Publications have been received.*

\* Societies, &c., which have received the Asiatic Society's publications, and have sent their publications in return.

† Societies, &c., which have received the Asiatic Society's publications, but have sent none in return.

§ Societies, &c., whose publications have been received, but to which nothing has been sent in return.

\* Allahabad :—Editor, Pioneer.

† Amsterdam :—Royal Zoological Society.

\* ——— :—Koninklijke Akademie van Wetenschappen.

† Angers :—Société d' Etudes Scientifiques d' Angers.

\* Baltimore :—Johns Hopkins University.

\* Batavia :—Society of Arts and Sciences.

\* ——— :—Kon Natuurkundige Vereeniging in Nederlandsch-Indië.

\* Berlin :—Gesellschaft Naturforschende Freunde zu Berlin.

\* ——— :—Royal Academy of Sciences.

§ ——— :—Entomologische Verein.

† Berne :—Société Suisse d' Entomologie.

§ Birmingham :—Birmingham Philosophical Society.

\* Bombay :—Anthropological Society.

\* ——— :—Bombay Branch, Royal Asiatic Society.

\* ——— :—Editor, Indian Antiquary.

\* ——— :—Editor, Times of India.

\* ——— :—Natural History Society.

\* Boston :—Natural History Society.

§ ——— :—American Philological Association.

§ Bordeaux :—L' Académie Nationale des Sciences, Belles-Lettres et Arts.

- \* Bordeaux :—Société Linnéenne.
- § ——— :—Royal Geographical Society of Australasia, Queensland Branch.
- † Brookville :—Society of Natural History.
- † Brunswick :—Verein für Naturwissenschaft.
- † Brussels :—L' Académie Royale des Sciences.
- † ——— :—Musée Royal d' Histoire Naturelle de Belgique.
- \* ——— :—Société Entomologique de Belgique.
- \* ——— :—Société Royale Malacologique de Belgique.
- § ——— :—Société Royale des Sciences de Liège.
- \* Buda Pest :—Royal Hungarian Academy of Sciences.
- § ——— :—La Société Hongroise de Géographie.
- \* Buenos Ayres :—National Museum.
- \* ——— :—Academia Nacional de Ciencias de la Republica Argentina.
- \* Calcutta :—Agri-Horticultural Society of India.
- \* ——— :—Geological Survey of India.
- \* ——— :—Editor, Englishman.
- \* ——— :—Editor, Hindoo Patriot.
- \* ——— :—Editor, Indian Daily News.
- § ——— :—Editor, Indian Engineering.
- \* ——— :—Editor, Indian Mirror.
- \* ——— :—Indian Museum.
- † ——— :—Mahommedan Literary Society.
- § ——— :—Photographic Society of India.
- † ——— :—Public Library.
- \* ——— :—Survey of India.
- \* ——— :—Tuttobodhini Shova.
- † ——— :—University Library.
- † Cambridge :—University Library.
- \* Cassel :—Der Verein für Naturkunde.
- \* Cherbourg :—Société Nationale des Sciences Naturelles.
- \* Christiania :—University Library.
- \* Colombo :—Ceylon Branch, Royal Asiatic Society.
- \* Copenhagen :—La Société Royale des Antiquaires du Nord.
- † Cuttack :—Cuttack Library.
- † Danzig :—Naturforschende Gesellschaft.
- \* Dehra Dun :—Great Trigonometrical Survey.
- \* Dorpat :—Naturforscher-Gesellschaft der Universität.
- \* Dresden :—Entomologischen Vereins "Iris."
- \* ——— :—Königlichen Zoologischen und Anthropologisch-Ethnographischen Museums zu Dresden.
- \* Dublin :—Royal Dublin Society.

- † Dresden :—Royal Irish Society.
- \* Edinburgh :—Royal Society.
- § ———— :—Royal Physical Society.
- \* ———— :—Scottish Geographical Society.
- \* Florence :—Società Italiana di Anthropologia, Etnologia e Psicologia Comparata.
- \* ———— :—Società Africana d' Italia.
- \* Frankfurt :—Senckenbergische Naturforschende Gesellschaft.
- \* ———— :—Naturwissenschaftlichen Vereins des Regierungsbezirks.
- \* Geneva :—Société de Physique et d' Histoire Naturelle.
- \* Genoa :—Museo Civico di Storia Naturale.
- \* Giessen :—Oberhessische Gesellschaft für Natur und Heilkunde.
- \* Graz :—Naturwissenschaftlicher Verein für Styria.
- § Hague :—Koninklijk Instituut voor de Taal-Land-en Volkenkunde van Nederlansch-Indië.
- \* Hamburg :—Naturhistorisches Museum zu Hamburg.
- § ———— :—Naturwissenschaftlichen Verein.
- † Halle :—Deutsche Morgenländische Gesellschaft.
- † ———— :—Kaiserlichen Leopoldinisch-Carolinische Akademie.
- † Hamilton :—Hamilton Association (Canada).
- \* Havre :—Société de Géographie Commerciale du Havre.
- \* Helsingfors :—Societas pro Flora et Fauna Fennica.
- † ———— :—Société des Sciences de Finlande.
- § Ithaca (U. S. A.) :—Cornell University.
- § Jassy :—Societății Stintifice Literare.
- \* Kiev :—Société des Naturalistes.
- \* Königsberg :—Die physikalische-Oekonomische Gesellschaft.
- \* Lahore :—Editor, Civil and Military Gazette.
- † ———— :—Agricultural Society.
- § Leipzig :—Deutsche Morgenländische Gesellschaft.
- † Leyden :—Royal Herbarium.
- \* Liège :—Société Géologique de Belgique.
- † ———— :—Société des Sciences.
- \* Liverpool :—Literary and Philosophical Society.
- \* London :—Anthropological Institute.
- \* ———— :—Editor, Academy.
- \* ———— :—Editor, Athenæum.
- \* ———— :—British Museum.
- \* ———— :—Geological Society.
- \* ———— :—Institution of Civil Engineers.
- \* ———— :—Institution of Electrical Engineers.
- \* ———— :—Institution of Mechanical Engineers.

- \* London :—Editor, *Nature*.
- \* ——— :—Linnean Society.
- † ——— :—Royal Asiatic Society of Great Britain and Ireland.
- \* ——— :—Royal Astronomical Society.
- \* ——— :—Royal Geographical Society.
- \* ——— :—Royal Institution of Great Britain.
- \* ——— :—Royal Microscopical Society.
- \* ——— :—Royal Society.
- \* ——— :—Statistical Society.
- \* ——— :—Zoological Society.
- † Lyons :—La Société d' Agriculture, d' Historie Naturelle et des Arts Utiles.
- † ——— :—Muséum d' Histoire Naturelle.
- \* ——— :—La Société d' Anthropologie.
- † Madison, Wisconsin :—Wisconsin Academy of Sciences, Arts, and Letters.
- † Madras :—Literary Society.
- \* ——— :—Government Central Museum.
- † Manchester :—Literary and Philosophical Society.
- § Melbourne :—Royal Society of Victoria.
- \* Mendon, Ill :—Editor, *American Antiquarian and Oriental Journal*.
- \* Mexico :—Sociedad Científica "Antonio Alzate."
- § ——— :—Observatorio Meteorológico-Magnético Central.
- § ——— :—Estados Unidos Mexicanos.
- § ——— :—Deutschen Wissenschaftlichen Vereins in Mexico.
- § Minneapolis :—Minnesota Academy of Natural Sciences.
- \* Moscow :—Société Imperiale des Naturalistes.
- \* ——— :—Imperial Society of Amateurs of Natural Sciences, Anthropology and Ethnology.
- \* Munich :—K. Bayerische Akademie der Wissenschaften.
- \* Naples :—Società Africana d' Italia.
- † New Haven :—Connecticut Academy of Arts and Sciences.
- § ——— :—American Oriental Society.
- † Newport (R. I.) :—Natural History Society.
- \* New York :—American Museum of Natural History.
- \* Ottawa :—Geological and Natural History Survey of the Dominion of Canada.
- † Oxford :—Bodleian Library.
- † ——— :—Indian Institute.
- \* Paris :—Société de Géographie.
- \* ——— :—Société d' Anthropologie.
- \* ——— :—Société Asiatique.

- \* Paris :—Musée Guimet.
- † — :—National Library.
- \* — :—Société Zoologique.
- \* — :—Société Académique Indo-Chinoise.
- § — :—Institution Ethnographique.
- † — :—Museum d' Historie Naturelle.
- \* Philadelphia :—Academy of Natural Sciences.
- § — :—American Philosophical Society.
- \* — :—Journal of Comparative Medicine and Surgery.
- \* Pisa :—Società Toscana di Scienze Naturali.
- § Prague :—K. K. Sternwarte.
- § Raleigh, N. C :—Elisha Mitchell Scientific Society.
- § Rio de Janeiro :—Imperial Observatorio.
- § Rome :—Società degli Spettroscopisti Italiani.
- § Roorkee :—Editor, Indian Forester.
- \* St. Petersburg :—Comité Géologique.
- † — :—Imperial Library.
- \* — :—Russian Geographical Society.
- \* — :—Académie Impériale des Sciences.
- \* — :—Jardin Impériale de Botanique.
- § — :—La Société des Naturalistes de Kiew.
- \* San Francisco :—Californian Academy of Arts and Sciences.
- \* Santiago :—Deutsche Wissenschaftliche Vereines.
- § Schaffhausen :—Swiss Entomological Society.
- \* Shanghai :—China Branch, Royal Asiatic Society.
- \* Simla :—United Service Institution of India.
- \* Stettin :—Entomological Society.
- \* Stockholm :—Entomologische Tidskrift.
- \* — :—Royal Swedish Academy of Sciences.
- \* Sydney :—Royal Society of New South Wales.
- \* — :—Linnean Society of New South Wales.
- § Taiping :—Government of Perak.
- \* Toronto :—Canadian Institute.
- \* Tokyo :—Imperial University of Japan.
- \* — :—Deutsche Gesellschaft für Natur-und Völkerkunde Ostasiens.
- § Trenton, N. J.—Trenton Natural History Society.
- \* Trieste :—Société Adriatica di Scienze Naturali.
- \* Turin :—Reale Accademia delle Scienze.
- § — :—Osservatio Regia Universita.
- † Ulwar :—Ulwar Library.
- \* Vienna :—Anthropologische Gesellschaft.

- \* Vienna :—K. K. Akademie der Wissenschaften.
- \* ——— :—K. K. Geologische Reichsanstalt.
- \* ——— :—K. K. Naturhistorische Hofmuseums.
- \* ——— :—K. K. Zoologisch-Botanische Gesellschaft.
- † ——— :—Ornithologische Verein.
- § ——— :—Österreichischen Touristen-Club.
- \* Washington :—Commissioners of the Department of Agriculture.
- \* ——— :—Smithsonian Institution.
- \* ——— :—United States Geological Survey.
- :—United States National Museum.
- § Wellington :—New Zealand Institute.
- \* Württemberg :—Natural History Society.
- † Yokohama :—Asiatic Society of Japan.
- \* Zagreb :—Archæological Society.

#### ABSTRACT OF COUNCIL PROCEEDINGS DURING 1890.

##### *January 30th, Ordinary Meeting.*

An offer from the Baptist Mission Press to make a reduction in the rate for printing extra copies of Author's papers in excess of 100 copies, and for title page and cover, was accepted.

Read a letter from the Deputy Commissioner of Hardoi, conveying the grateful acknowledgments of the Committee of the Colvin Library for the presentation of books made by the Council.

An enquiry from the Government of India regarding the merits of Dr. Leitner's Hunza and Nagyr Hand-book was referred to the Philological Committee.

An application from Pundit Satya Vrata Samasrami for permission to edit the *Aitareya Brahmana*, with the commentary of Sargaua, and explanatory notes, was referred to the Philological Committee.

It was resolved with reference to a representation made by the Finance Committee regarding the very heavy expenditure on the Journal, Part II, that a quarterly statement of accounts should be submitted by the Natural History Secretary.

##### *February 27th, Ordinary Meeting.*

Two copies of a new publication called the "Usha," to contain works of Vedic literature, edited by Pundit Satya Vrata Samasrami, were ordered to be subscribed for.

Messrs. Meugens and King were appointed Auditors of the Society's Accounts for the present year.

Permission was given to the Baptist Mission Press to make the



following charges for "doing up" Supplements to the Journal, viz., Rupees 5 for numbers not exceeding, or only slightly exceeding 100 pages; Rupees 8 for numbers extending to 200 pages, or thereabouts; and Rupees 3-8 for numbers equal to an average Proceedings, or less.

The sum of Rs. 2,500 was assigned to Part II of the Journal, and Rupees 1,500 to Part I, as a provisional arrangement for the current year.

It was decided that the Trustees of the Indian Museum should be asked to pay one-third of the cost for printing the lists of Insects of the Oriental Region in consideration of 100 extra copies of the lists being supplied to the Trustees.

The various Committees for 1890 were appointed.

The Philological Committee having recommended that no new works should be sanctioned for publication in the Bibliotheca Indica for the present, an intimation to that effect was made to Pandit Satya Vrata Samasrami with reference to his application to edit the *Aitareya Brahmana*.

A proposal by Bábú Asutosh Mukhopadhyáya to publish certain Astronomical works, was referred to the Philological Committee.

Bábú Gaurdás Bysack was informed with reference to his application for aid in tracing the history of Calcutta to the earliest possible period, that the Council, while sympathizing with his objects, were unable to materially forward his views.

#### 27th March, Ordinary Meeting.

Permission was given to Dr. Gustav Oppert to purchase a copy of all the Sanskrit works published by the Society at the same rate of discount as allowed to Booksellers.

The loan of the Persian manuscript *Tazkirah-i-Al-i-Daud* in the Society's library was sanctioned to Dr. Oskar Mann of Berlin, through the German Consulate General in Calcutta.

Bábú Saratchandra Dás was allowed to take to Darjeeling two Tibetan Xylographs for the purpose of getting them tabulated in connection with the Tibetan Dictionary which he is compiling for Government.

The Government of India was informed that the Society was not in a position to give an opinion as to the merits of Dr. Leitner's Hunza and Nagyr Hand-book.

An offer from Otto Harrassowitz of Leipzig to act as Commission Agent to the Society for the sale of the Bibliotheca Indica publications for Germany and the Continent was declined.

An exchange of publications with the Geographical Society of Leipzig was approved.

The Linnean Society of New South Wales were asked to give the back numbers of their Proceedings from 1882 in exchange.

*May 1st, Ordinary Meeting.*

Mr. H. Beveridge was appointed a Trustee of the Indian Museum on behalf of the Asiatic Society in place of Mr. E. Gay, leaving India.

Read a letter from the Honorary Secretary to the Trustees Indian Museum, forwarding an extract from the proceedings of the General Committee of the Trustees conveying to Mr. Gay the expression of the Trustees thanks for his services and regret at losing him.

The publications of the Bibliotheca Indica were ordered to be sent to the Toronto University, Canada, the building having been destroyed by fire with its valuable Library and collections.

An offer from the Museum d'Histoire Naturelle, Paris, for an exchange of publications to commence from 1889, with the 3rd Series of the "Nouvelles Archives du Museum" was accepted.

A letter from the Honorary Secretary of the Photographic Society of India offering to rent two rooms on the ground floor of the Asiatic Society's building at Rs. 60 a month, was circulated to the Council.

On the recommendation of the Philological Secretary, the Council approved the nomination by Dr. A. Chatterjee of the Vaidya Pandit to aid him in the translation of the *Susruta*.

*May 29th, Ordinary Meeting.*

A letter from Mahádev Chimnâji Apté intimating that he had founded an "Anandás'rama" at Poona for the collection and publication of Sanskrit Manuscripts and forwarding copies of three of the works published, with a request to be informed of the character of the work done, was referred to the Philological Committee.

Read a letter from the Honorary Secretary to the Trustees of the Indian Museum reporting that the Trustees would contribute for the present year one-third of the amount incurred in printing the Catalogues of Oriental Insecta.

The names of Astronomers in India were furnished to the Director of the Specula Vaticana at Rome with reference to his report that the Vatican Observatory had been revived, and that steps were being taken to make it as useful as possible to science.

A draft letter to the Photographic Society of India embodying the terms on which they would be allowed to rent two rooms on the ground floor of the Asiatic Society's building was circulated to the Members of Council.

It was resolved that the 1st fasciculus of the Catalogue of Persian

books and Manuscripts in the Society's library should be sold at one rupee, and the 2nd fasciculus at eight annas a copy: copies to be distributed to all persons on the Bibliotheca Indica list, and the Maulvi to be paid at the rate of Rs. 1-4 per page for his labor in compiling the Catalogue.

The recommendation of the Finance Committee that future editions of works published through the Oriental Publication Fund should be reduced from 500 to 300 copies of each fasciculus was confirmed.

Captain Sadler consented to act as Philological Secretary during the absence of Dr. Hoernle on leave.

*June 26th, Ordinary Meeting.*

The Linnean Society of New South Wales consented to an exchange of back publications from 1882.

The condolences of the Council were conveyed to the Koninklijk Zoologisch Genootschap, Amsterdam, on the death of Dr. G. F. Westerman, the Founder and Director of the Society.

The University of Lyon was informed in reply to an application for the back numbers of the Bibliotheca Indica publications to complete the sets in their Library, that the books could not be spared.

An application from the Directors of the Deutscher Wissenschaftlicher Verein, Mexico, for an exchange of publications was declined with thanks.

On the report of the Philological Secretary an application from Pandit Jaistharam Muccondjea of Bombay for permission to reprint all the works of the Bibliotheca Indica that are out of stock or incomplete was refused, but he was informed that an application to reprint any particular work would be considered.

The Photographic Society of India were informed of the conditions on which they would be allowed the use of the two rooms on the ground floor of the Asiatic Society's building.

A suggestion from Mr. C. J. Rodgers to catalogue the Society's Coins was deferred till he came to Calcutta.

Sanction was given to the entertainment by Bábu Pratáphandra Ghosha of a Pundit on Rs. 50 a month to assist him in editing the "*Sher-Phyin*."

Dr. Hoernle reported that the grave of the late Mr. Blochmann in the Circular Road Cemetery was in very good condition, and needed no repairs at present.

A Resolution by the Finance Committee regarding the expenditure on Part II of the Journal having exceeded the budget allowance, and

suggesting that the attention of the Editor should be drawn thereto, was confirmed.

*July 31st, Ordinary Meeting.*

The Photographic Society of India reported acceptance of the conditions prescribed by the Council for renting the two rooms they had applied for, and permission was given to make the necessary alterations to suit the rooms to their requirements.

Dr. Prain was informed in reply to a request to pay for the printing of his paper on "An additional species of *Ellipanthus*," and the plate to accompany it, that there would be no objection to his printing the plate, but that the cost of printing the text would be borne by the Society.

It was decided on the report of the Philological Committee not to express an opinion as to the character of the Sanskrit works published by Mahādev Chinmāji Apté, but that copies of the works should be purchased for the Society's Library.

A recommendation by the Finance Committee to modify Rule 70, so as to allow of Admission Fees being treated as ordinary income, instead of being invested in the Permanent Reserve Fund, was referred to Resident Members in accordance with Rule 64, (a).

The Government Promissory Notes amounting to Rs. 1,20,000, belonging to the Society standing in the  $4\frac{1}{2}$  per cent. loans of 1878 and 1879, which mature on 15th September 1893, were authorized to be transferred to the 4 per cent. loan of 1854-55, in terms of the Notification of the Government of India offering payment in cash of the additional  $\frac{1}{2}$  per cent. interest up to date of maturity.

*August 28th, Ordinary Meeting.*

The Director of the National Society of Natural Sciences and Mathematics, Cherbourg, was informed in reply to an application for the Journal, Part I, which had not been received since 1886 that it had not been sent, as it treats of Philology and Antiquities.

Sanction was given to an expenditure of Rs. 35 for the purchase of a copper plate inscription found at Ashraffpur in the Dacca district. A description of the plate has been published in the Journal.

It was resolved on the report of the Finance Committee to revert to the old rates of changes for the Journals and Proceedings of the Society, and that circulars of the Bibliotheca Indica publications should be prepared in Urdu, Devanagari and Bengali characters in order to make the works better known to the educated classes.

A paper by Saratchandra Mitra on the "Diseases of Animals in Captivity" was declined with thanks.

A list of the members in arrear of subscription for two years and upwards was ordered to be brought up at the next general meeting of the Society with a view to determine the steps to be taken to recover the amounts, and a Sub-Committee was appointed to consider the question of payment of subscription yearly in advance and the rules regulating procedure in collecting arrears.

The sale of Government Promissory notes for Rs. 2,400 belonging to the Oriental Publication Fund was sanctioned to pay off bills of the Baptist Mission Press.

An estimate amounting to Rs. 178-2-3, approved by the Engineer to the Corporation, for making certain alterations in the drainage of the Society's premises, was sanctioned with reference to a notice received from the Municipality.

The publication of Mr. Hoey's report on the excavations and exhumations at Sahet Mahet in the Banda district was ordered to be undertaken, with reference to an intimation from that gentleman that it was now quite ready.

It was agreed that Captain Sadler should ask Dr. Solf to take up the duties of Philological Secretary in the event of his leaving Calcutta, and that Colonel Waterhouse should take charge of the Journal, Part II, whilst Mr. Sclater was on leave.

*September 25th, Ordinary Meeting.*

A resolution was recorded deploring the very great loss the Asiatic Society of Bengal and Indian Natural Science have sustained by the untimely death of Mr. E. F. T. Atkinson, a former President and Vice-President of the Society; and a copy of the resolution was forwarded to Mrs. Atkinson, with a letter of condolence signed by all the Members of Council.

Bábú Man Mohan Chakravarti was asked to prepare an abstract of his paper on certain inscriptions in the Jaganath temple at Puri, and the great temple of Mahadev at Bhuvaneshwar, of the Orissa kings of the 15th and 16th centuries.

The proceedings of the Sub-Committee appointed to consider the revision of the rule relating to the procedure for collecting arrear subscriptions were circulated to the Members of Council.

*October 30th, Ordinary Meeting.*

Pandit GungaDutt Upreti was informed in reply to a letter asking for the aid of the Society to assist him in publishing a work on "Proverbs and Folk-lore of the Provinces of Kumaon and Gharwal" that it was not possible to help him in the matter.

An application from the Société Botanique Bavaroise, Bavaria, for an exchange of publications was declined with thanks.

The thanks of the Council were conveyed to Mr. V. A. Smith for his suggestion to obtain greater punctuality in issuing the Society's Journals, and he was informed that arrangements to that effect were being made.

The report of the Sub-Committee appointed to revise the rules relating to the procedure for collecting arrears of subscriptions and payment of subscriptions annually in advance, was taken into consideration.

*November 27th, Ordinary Meeting.*

Applications from the Museo de la Plata, Buenos Aires, and the Entomological Society of Ontario, for exchange of publications, were referred to the Natural History Committee.

It was decided to discontinue the publication of the Catalogues of Oriental Insecta, which had been issuing as a Supplement to the Journal, Part II.

Read a letter from the Chancellor Imperial and Royal Austro-Hungarian Consulate, Calcutta, forwarding at the request of the Ministry of Foreign Affairs, Vienna, invitations for the second International Ornithological Congress to be held at Budapest in May, 1891.

Permission was given to the Photographic Soc'y of India to store their exhibition pictures in an unused room on the ground floor for a short time whilst the building in which the exhibition is to be held is being got ready.

The Minutes of the Members of Council on a note by the President proposing to invest a sum of Rs. 50,000 out of the Permanent Reserve Fund of the Society in securities bearing a higher rate of interest were taken into consideration, and it was determined to recommend to the Society that the amount should be invested in Municipal or Port Trust Debentures.

The publication of the translation of *Tuzuk-i-Jahangiri*, which had been undertaken by the Rev. W. H. Lowe of Cambridge, was ordered to be stopped, only one fasciculus has been issued.

Intimation was given to the Calcutta Public Library that the presentation of the Society's Journal and Proceedings would be discontinued.

Sanction was accorded to an expenditure of Rs. 30 for preparing an index to the Catalogue of Insecta of the Oriental Region.

*December 18th, Ordinary Meeting.*

Read a letter from the Government of Bengal conveying the cordial

approval of the Lieutenant-Governor to the manner in which the Government grants-in-aid to the Oriental Publication Fund and the Sanskrit Manuscript Fund were applied during the past year.

Bábú Saratchandra Mitra was informed in reply to a letter asking for a list of the copper plate Sanads added to the Society's collection since 1849, that no such list had been prepared, but that the plates would be at his disposal if he became a member of the Society.

An application from Mr. B. N. Dé to undertake a translation of the *Siyar-ul-Mutakerin* for the Bibliotheca Indica was circulated to the Philological Committee.

An application from the Society's servants for the grant of warm clothing for the season was refused.

The Entomological Society of Ontario were asked to furnish a specimen copy of their publications with reference to their offer to place the Asiatic Society on their exchange list.

The application of the Director of the Museo de la Plata, Buenos Aires, for an exchange of publications, was accepted on the recommendation of the Natural History Committee.

The lists of Members in arrear of subscriptions were referred to the Treasurer.

The list of Office-Bearers and Members of Council for 1891 were prepared, ordered to be circulated to Resident Members in accordance with Rule 44.

The translation of the *Riyazu-s-Salátin* was ordered to be stopped the publication of the work not having been commenced.

The Natural History Secretary was authorized to incur an expenditure of Rs. 20 for preparing an index to the first part of the Catalogue of the late Mr. Atkinson of the Insecta of the Oriental Region.

The Report having been read the PRESIDENT invited the meeting to put any questions or to offer any remarks which any Member might think necessary in connection therewith.

No remarks having been offered the PRESIDENT moved the adoption of the report, and proposed a vote of thanks to the Honorary Secretaries and Treasurer for their exertions in behalf of the Society. The motion was carried unanimously.

The PRESIDENT then delivered an Address.

(The Address has been printed separately from the Proceedings.)

The **PRESIDENT** announced that the Scrutineers reported the result of the election of Office-Bearers and Members of Council to be as follows :

*President.*

Hon. Sir A. W. Croft, K. C. I. E., M. A.

*Vice-Presidents.*

Rájá Rájendralála Mitra, C. I. E., LL. D.

J. Wood-Mason, Esq.

A. Pedler, Esq., F. C. S.

*Secretaries and Treasurer.*

Dr. A. F. R. Hoernle.

W. L. Sclater, Esq.

C. Little, Esq., B. A.

W. King, Esq., B. A., B. Sc.

*Other Members of Council.*

Dr. J. Scully.

Pandit Haraprasád Shástri, M. A.

Dr. D. D. Cunningham.

Prince Jahán Qadr Muhammad Wáhid Alí Bahádur.

Bábú Gaurdás Bysack.

Dr. A. Crombie.

Bábú Pratápachandra Ghosha, B. A.

C. H. Tawney, Esq., M. A.

L. de Nicéville, Esq., F. E. S.

Colonel H. S. Jarrett.

Dr. Mahendralál Sarkár, C. I. E.

E. C. Cotes, Esq.

The meeting was then resolved into the Ordinary Monthly General Meeting—

HON. SIR A. W. CROFT, President in the Chair.

The Minutes of the last meeting were read and confirmed.

Thirty-four presentations were announced, details of which are given in the Library List appended.

The following gentlemen, duly proposed and seconded at the last meeting of the Society, were ballotted for and elected Ordinary Members :

Hon. Lala Bunbehari Kuppur.

Duncan J. Macpherson, Esq., O. S.



The following gentlemen are candidates for election at the next meeting :

D. C. Baillie, Esq., C. S., Allahabad, proposed by V. A. Smith, Esq., C. S., seconded by J. Hooper, Esq., C. S.

Dr. Aghorechunder Chatterjee, proposed by Rájá Rajendralála Mitra, seconded by Colonel J. Waterhouse.

The following gentlemen have expressed a wish to withdraw from the Society :

J. H. Apjohn, Esq., M. I. C. E.

Thakur Surj Bukhsh Singh.

Lieutenant-Colonel C. R. Macgregor, F. R. G. S.

The SECRETARY reported that election of Captain A. Brame had been cancelled at the request of that gentleman, who intimated that he would be shortly leaving Calcutta, and was quite uncertain when he would return.

The PRESIDENT announced that the proposal of the Council to transfer a sum of Rs. 50,000 belonging to the Society's *Permanent Reserve Fund* from the Government 4 per cent. loan to Municipal or other Debentures bearing a higher rate of interest would now be brought forward for consideration.

The proposal was cordially agreed to.

The following papers were read :—

1. *On thirteen copper plates of King Narsinha Deva, of Orissa.*—By MANMOHAN CHAKRAVARTI.

2. *On two copper plates of King Kulastambha Deva, of the Chalukya dynasty.*—By MAN MOHAN CHAKRAVARTI.

The papers will be published in the Journal, Part I.

### LIBRARY.

The following additions have been made to the Library since the Meeting held in January last.

### TRANSACTIONS, PROCEEDINGS AND JOURNALS,

*presented by the respective Societies and Editors.*

Angers. La Société d'Études Scientifiques d'Angers,—Bulletin, 1888

Baltimore. Johns Hopkins University,—Circulars, Vol. X, No. 84.

Berlin. Berliner Entomologische Zeitschrift,—Band XXXV, Heft 2

- Berlin. Der Königlichen Akademie der Wissenschaften zu Berlin,—  
Abhandlungen, 1889.
- . ———. Sitzungsberichte, XX—XL.
- Brisbane. Queensland Branch of the Royal Geographical Society of  
Australasia,—Proceedings and Transactions, Vol. V, Part 2.
- Calcutta. Geological Survey of India,—Records, Vol. XXIII, Part 4.
- . Indian Engineering,—Vol. IX, Nos. 2—5.
- Edinburgh. The Scottish Geographical Society,—Magazine, Vol. VI,  
Nos. 11 and 12.
- Havre. Société de Géographie Commerciale du Havre,—Bulletin,  
Novembre-Décembre, 1890.
- Helsingfors. Finska Vetenskaps-Societeten,—Bidrag, Häftet 48.
- . ———. Öfversigt, XXXI.
- Jassy. Societăți Științifice Și Literare din Iași,—Arhiva, An. II,  
Nos. 3—4<sup>o</sup>.
- London. Anthropological Institute of Great Britain and Ireland,—  
Journal, Vol. XX, No. 2.
- . Nature,—Vol. XLIII, Nos. 1103—1107.
- . Royal Astronomical Society,—Monthly Notices, Vol. L, No.  
9; and Appendix to Vol. L.
- . Royal Geographical Society,—Proceedings, Vol. XII (New  
Series), Nos. 9—12.
- . The Academy,—Nos. 972—976.
- . The Athenæum,—Nos. 3295—3299.
- Mexico. Estados Unidos Mexicanos,—Imformes y Documentos relativos  
á Comercio Interior y Exterior Agricultura é Industrias, Nos. 61—  
64.
- Moscow. La Société Impériale des Naturalistes de Moscou,—Bulletin,  
No. 2, 1890.
- Naples. La Società Africana D' Italia,—Bollettino, Anno IX, Fasc. 11  
et 12.
- New Haven. American Oriental Society,—Proceedings, October 22nd  
and 23rd, 1890.
- New York. American Museum of Natural History,—Bulletin, Vol.  
III, No. 1; and Pages 117—122 of Vol. III.
- Paris. Du Muséum d' Histoire Naturelle,—Nouvelles Archives, III<sup>e</sup>  
série, Tome I, Fasc. 1 et 2; Tome II, Fasc. 1.
- . Journal Asiatique,—Tome XVI (VIII<sup>e</sup> série), No. 1.
- . La Société D' Anthropologie de Paris,—Bulletins, Tome XII  
(III<sup>e</sup> série), Fasc. 4; Tome XIII (IV<sup>e</sup> série), Fasc. I.
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### BOOKS AND PAMPHLETS,

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### MISCELLANEOUS PRESENTATIONS.

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Returns of the Rail-borne Traffic of the Central Provinces during the quarter ending 30th September 1890. Fcp. Nagpur, 1891.

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Report on the River-borne Traffic of the Lower Provinces of Bengal, and on the Inland Trade of Calcutta and on the Trade of Chittagong and the Orissa Ports, for the year 1889-90. Fcp. Calcutta, 1890.

Resolution reviewing the Reports on the working of the District Boards in Bengal, during the year 1889-90. Fcp. Calcutta, 1890.

Returns of the Rail and River-borne Trade of Bengal during the quarter ending the 30th September 1890. Fcp. Calcutta, 1891.

GOVERNMENT OF BENGAL.

Excursions et Reconnaissances Cochinchine Française, Vol. XV, No. 33. 8vo. Hanoi, 1890.

[GOVERNMENT OF FRENCH COCHIN CHINA.

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———. Revue de Linguistique et de Philologie Comparée,—Tome XXIII, Fasc. 4.

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Vienna. Vienna Oriental Journal,—Vol. IV, No. 4.





LIST OF MEMBERS  
OF THE  
ASIATIC SOCIETY OF BENGAL.  
ON THE 31ST DECEMBER 1890.



LIST OF OFFICE-BEARERS AND MEMBERS OF  
COUNCIL FOR THE YEAR 1890.

*President.*

H. Beveridge, Esq., C. S.

*Vice-Presidents.*

Col. J. Waterhouse, B. S. C.

Rájá Rájendralála Mitra, C. I. E., LL. D.

J. Wood-Mason, Esq.

*Secretaries and Treasurer.*

Dr. A. F. R. Hoernlo.

W. L. Selater, Esq.

C. Little, Esq., B. A.

W. King, Esq., B. A., D. Sc.

*Other Members of Council.*

Dr. J. Scully.

Pandit Haraprasád Shástri, M. A.

Dr. D. D. Cunningham.

Hon. Sir A. W. Croft, K. C. I. E., M. A.

Prince Jalán Qadr Muhammad Wáhid Alí, Bahádur.

Bábu Gaurdás Bysack.

Dr. A. Crombie.

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C. H. Tawney, Esq., M. A.

L. de Nicéville, Esq., F. E. S.

## LIST OF ORDINARY MEMBERS.

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R. = Resident. N. R. = Non-Resident. A. = Absent. N. S = Non-Subscribing  
L. M. = Life Member. F. M. = Foreign Member.

N. B.—Members who have changed their residence since the list was drawn up are requested to give intimation of such a change to the *Secretaries*, in order that the necessary alteration may be made in the subsequent edition. Errors or omissions in the following list should also be communicated to the Secretaries.

Members who are about to leave India and do not intend to return are particularly requested to notify to the *Secretaries* whether it is their desire to continue Members of the Society; otherwise, in accordance with Rule 40 of the By-Laws, their names will be removed from the list at the expiration of three years from the time of their leaving India.

| Date of Election |      |                                                                                                                     |
|------------------|------|---------------------------------------------------------------------------------------------------------------------|
| 1860 Dec. 5.     | R.   | Abdul-Latif, Nawáb Bahádúr, C. I. E. <i>Calcutta.</i>                                                               |
| 1888 Feb. 1.     | N.R. | Adamson, Major Charles Henry Ellison, M. S. C.,<br>Deputy Commissioner. <i>Rangoon.</i>                             |
| 1889 Nov. 6.     | R.   | Adie, J. R., M. B., Surgeon, Eden Hospital. <i>Calcutta.</i>                                                        |
| 1860 July 4.     | N.R. | Ahmad Khán, Bahádúr, Hon. Maulvi Sir Sayid,<br>K. C. S. I. <i>Aligarh.</i>                                          |
| 1888 April 4.    | R.   | Ahmud, Maulvi, Khán Bahádúr, Arabic Professor,<br>Presidency College. <i>Calcutta.</i>                              |
| 1872 April 3.    | N.R. | Ashán-ullah, Khán Bahádúr, Nawáb. <i>Dacca.</i>                                                                     |
| 1888 Feb. 1.     | N.R. | Alcock, Alfred William, M. B., Surgeon Naturalist,<br>Marine Survey Department.                                     |
| 1884 Mar. 5.     | L.M. | Ali, Sir Ali Qadr Syud Hassan, Nawáb Bahádúr,<br>K. C. I. E. <i>Murshedabad.</i>                                    |
| 1874 June 3.     | R.   | Amir Ali, Hon. C. I. E., M. A. Barrister-at-Law,<br>Judge, High Court. <i>Calcutta.</i>                             |
| 1865 Jan. 11.    | F.M. | Anderson, John, M. D., F. R. S., F. L. S. <i>Europe.</i>                                                            |
| 1884 Sept. 3.    | R.   | Anderson, J. A. <i>Calcutta.</i>                                                                                    |
| 1887 June 1.     | R.   | Apjohn, J. H., M. I. C. E., P. W. Dept. <i>Calcutta.</i>                                                            |
| 1890 July 2.     | N.R. | Arnold, Thomas Walker, B. A., M. R. A. S., Pro-<br>fessor, Muhammadan Anglo-Oriental College.<br><i>Aligarh.</i>    |
| 1869 Feb. 3.     | N.R. | Attar Singh, Bahádúr, Mahámahopidhyáya Sirdár,<br>Sir, K., C. I. E., M. U. F., Chief of Bhadour.<br><i>Ludiana.</i> |
| 1889 Aug. 29.    | N.R. | Aziz-ud-din Ahmad, Deputy Collector and Magis-<br>trate. <i>Jaunpur.</i>                                            |

| Date of Election. |      |                                                                                                                                 |
|-------------------|------|---------------------------------------------------------------------------------------------------------------------------------|
| 1870 Feb. 2.      | L.M. | Baden-Powell, Baden Henry, C. I. E., C. S. <i>Europe.</i>                                                                       |
| 1865 Nov. 7.      | N.S. | Ball, Valentine, M. A., F. R. S., F. G. S. <i>Europe.</i>                                                                       |
| 1889 May 1.       | R.   | Banerji, Hon. Dr. Gurudás, M. A., D. L., Judge, High Court. <i>Calcutta.</i>                                                    |
| 1862 Aug. 1.      | N.R. | Barclay, Arthur, M. B., Surgeon Major, Sec. to Surgeon General and Sanitary Commissioner with the Govt. of India. <i>Simla.</i> |
| 1869 Dec. 1.      | L.M. | Barker, R. A., M. D., Civil Surgeon. <i>Serampore.</i>                                                                          |
| 1877 Jan. 17.     | N.R. | Barman, Kishor Kumár Rádhá Dev, Juvraj of Hill Tipperah. <i>Tipperah.</i>                                                       |
| 1885 Nov. 4.      | R.   | Barman, Dámudar Dás. <i>Calcutta.</i>                                                                                           |
| 1887 Aug. 3.      | R.   | Basu, Haricharan. <i>Calcutta.</i>                                                                                              |
| 1886 June 2.      | F.M. | Baumgarten, Casper Wilhelm. <i>Batavia.</i>                                                                                     |
| 1864 Sept. 7.     | N.R. | Beames, John, C. S., Commissioner, Bhaugulpore Division.                                                                        |
| 1878 Sept. 25.    | N.R. | Beighton, T. D., C. S., Judge. <i>Dacca.</i>                                                                                    |
| 1876 Nov. 15.     | R.   | Beveridge, Henry, C. S., District and Sessions Judge. <i>Alipur.</i>                                                            |
| 1878 Oct. 4.      | R.   | Bhakta, Krishna Gopál. <i>Calcutta.</i>                                                                                         |
| 1879 Mar. 5.      | N.R. | Biddulph, Col. J., B. S. C. <i>Ajnere.</i>                                                                                      |
| 1884 Jan. 2.      | A.   | Bidie, G., Surgeon-General C. I. E., F. L. S., M. B., <i>Europe.</i>                                                            |
| 1884 Feb. 6.      | N.R. | Bigg-Wither, Major A. C., B. A., A. I. C. E. <i>Quetta.</i>                                                                     |
| 1885 Mar. 4.      | N.R. | Bilgrámi, Syud Ali, B. A., A. R. S. M., F. G. S. <i>Hyderabad.</i>                                                              |
| 1886 Aug. 4.      | N.R. | Bingham, Major Charles Thomas, B. S. C., Deputy Conservator of Forests. <i>Burmah.</i>                                          |
| 1857 Mar. 4.      | L.M. | Blanford, H. F., A. R. S. M., F. R. S., F. G. S. <i>England.</i>                                                                |
| 1859 Aug. 3.      | L.M. | Blanford, W. T., A. R. S. M., F. R. S., F. G. S., F. R. G. S., F. Z. S. <i>London.</i>                                          |
| 1885 Mar. 4.      | R.   | Bolton, C. W., C. S., 24- <i>Pergunnahs.</i>                                                                                    |
| 1890 July 2.      | R.   | Bonnerjee, Womes Chunder, Barrister, Middle Temple. <i>Calcutta.</i>                                                            |
| 1880 Nov. 3.      | N.R. | Bose, Pramatha Náth, B. Sc., F. G. S., Geological Survey of India.                                                              |
| 1890 Dec. 3.      | N.R. | Bose, Rai Nali Naksha, Bahádur, Chairman Burdwan Municipality. <i>Burdwan.</i>                                                  |
| 1876 Nov. 15.     | N.R. | Bowie, Colonel, M. M. Inspector General of Police C. P. <i>Nagpur.</i>                                                          |
| 1868 Jan. 15.     | N.R. | Boxwell, John, C. S., Commissioner, Patna Division.                                                                             |
| 1876 May 4.       | N.R. | Bradshaw, Deputy Surgeon-General A. F., Honorary Surgeon to the Viceroy, M. D. <i>Rawal Pindi.</i>                              |
| 1890 Dec. 3.      | R.   | Brame, Captain A. <i>Calcutta.</i>                                                                                              |
| 1860 Mar. 7.      | L.M. | Brandis, Sir Dietrich, K. C. I. E., C. I. E., Ph. D., F. L. S., F. B. S. <i>Europe.</i>                                         |

| Date of Election. |      |                                                                                                         |
|-------------------|------|---------------------------------------------------------------------------------------------------------|
| 1887 May 4.       | R.   | Burál, Nobinchánd, Solicitor. <i>Calcutta.</i>                                                          |
| 1862 Feb 5.       | L.M. | Bysack, Gaurdás. <i>Calcutta.</i>                                                                       |
| 1879 April 2.     | R.   | Calcutta, The Rt. Rev. the Lord Bishop of. <i>Calcutta.</i>                                             |
| 1880 Mar. 3.      | A.   | Carlleyle, A. C., Archæological Survey of India. <i>Europe.</i>                                         |
| 1881 Feb. 2.      | N.R. | Carter, Philip John, Deputy Conservator of Forests. <i>Burmah.</i>                                      |
| 1890 June 4.      | N.R. | Chakravarti, Man Mohan, M. A., B. L., Deputy Magistrate. <i>Puri.</i>                                   |
| 1889 April 3.     | R.   | Chandra, Goneschandra, Solicitor. <i>Calcutta.</i>                                                      |
| 1881 Mar. 2.      | N.R. | Channing, Francis Chorley, c. s. <i>Hoshiarpur.</i>                                                     |
| 1880 Jan. 7.      | R.   | Chaudhuri, Govinda Kumár. <i>Calcutta.</i>                                                              |
| 1861 Mar. 1.      | N.R. | Chaudhuri, Harachandra, Zemindar. <i>Sherpur Mymensingh.</i>                                            |
| 1880 Nov. 3.      | N.R. | Chaudhuri, Rái Khired Chandra. Deputy Inspcctor of Schools, Sonthal Pergunnahs. <i>Dumka.</i>           |
| 1886 April 7.     | N.R. | Chaudhuri, Rádháballabha. <i>Sherpur, Mymensingh.</i>                                                   |
| 1885 Feb. 4.      | N.R. | Chaudhuri, Rájá Suryakánta, Bahádur. <i>Mymensingh.</i>                                                 |
| 1890 Feb. 5.      | A.   | Chuckerbutty, A. Goodeve, B. C. S. <i>Europe.</i>                                                       |
| 1889 Sept. 26.    | N.R. | Chuckerbutty, Rájá Ramranjan, Bahádur. <i>Hitampur, Beerbhoom.</i>                                      |
| 1885 April 1.     | N.R. | Clark, H. Martyn, M. B. <i>Amritsar.</i>                                                                |
| 1877 Aug. 30.     | R.   | Clarke, Lieut.-Col. Henry Wilberforce, R. E. <i>Calcutta.</i>                                           |
| 1880 Aug. 26.     | F.M. | Clerk, Colonel Malcolm G. <i>Europe.</i>                                                                |
| 1881 May 4.       | N.R. | Cockburn, John, Asst. Sub-Deputy Opium Agent. <i>Karwi, Banda, N.-W. P.</i>                             |
| 1888 Nov. 1.      | N.R. | Collett, Brigadier General, Henry, C. B., F. L. S. <i>Shillong, Assam.</i>                              |
| 1889 Nov. 6.      | R.   | Colville, William Brown. <i>Calcutta.</i>                                                               |
| 1886 Aug. 26.     | F.M. | Condanhove, Count H., Attaché Austro-Hungarian Legation. <i>Constantinople.</i>                         |
| 1890 Dec. 3.      | R.   | Connan, William, C. E., Public Works Department. <i>Calcutta.</i>                                       |
| 1874 Nov. 4.      | F.M. | Constable, Archibald, M. I. C. E. <i>England.</i>                                                       |
| 1884 Aug. 6.      | R.   | Cotes, Everard Charles, Indian Museum. <i>Calcutta.</i>                                                 |
| 1876 Mar. 1.      | R.   | Crawford, James, B. A., C. S., Barrister-at-Law, Offg. District and Sessions Judge. <i>Hughli.</i>      |
| 1887 Aug. 25.     | R.   | Cripser, William Risdon, F. C. S., F. I. C., A. R. S. M. <i>Kasipur.</i>                                |
| 1877 June 6.      | R.   | Croft, The Hon. Sir A. W., K. C. I. E., M. A., Director of Public Instruction, Bengal. <i>Calcutta.</i> |
| 1874 Mar. 4.      | R.   | Crombie, Alexander, M. D., Surgeon Major, Presidency General Hospital. <i>Calcutta.</i>                 |
| 1888 Dec. 5.      | N.R. | Cooke, William, B. A., C. S., Magistrate and Collector. <i>Mirzapur.</i>                                |

| Date of Election. |      |                                                                                                             |
|-------------------|------|-------------------------------------------------------------------------------------------------------------|
| 1873 Aug. 6.      | R.   | Cunningham, David Douglas, Surgeon-Major. Honorary Surgeon to the Viceroy. <i>Calcutta.</i>                 |
| 1873 Dec. 3.      | N.R. | Dames, Mansel Longworth, c. s., Asst. Commissioner. <i>Dera Ghazi Khan.</i>                                 |
| 1877 June 6.      | N.R. | Darbhanga, Sir Luchmessur Sing, Bahádur, K. C. I. E., Mahárajá of. <i>Darbhanga.</i>                        |
| 1865 June 7.      | N.R. | Dás, Rájá Jaykrishna, Bahádur, c. s. I. <i>Bijnor.</i>                                                      |
| 1879 April 7.     | N.R. | Dás, Rám Saran, M. A., Secy., Oudh Commercial Bank, Limited. <i>Fyzabad, Oudh.</i>                          |
| 1885 May 6.       | N.R. | Dé, Rájá Baikuntanáth, Bahádur. <i>Balasore.</i>                                                            |
| 1889 May 1.       | N.R. | Delawar Hosaeen Ahmed, Meerza. <i>Gya.</i>                                                                  |
| 1862 May 7.       | N.R. | Dhanapati Singh Dughar, Rai Bahádur. <i>Azimganj.</i>                                                       |
| 1877 July 4.      | R.   | Diler Jang, Nawáb Syad Ashgar Ali, Khán Bahádur, c. s. I. <i>Calcutta.</i>                                  |
| 1890 July 2.      | R.   | Donaldson, P. <i>Calcutta.</i>                                                                              |
| 1886 June 2.      | R.   | Doyle, Patrick, C. E., F. G. S., M. R. A. S. <i>Calcutta.</i>                                               |
| 1887 Nov. 2.      | N.R. | Driver, Walter Henry Parker. <i>Ranchi, Lohardugga.</i>                                                     |
| 1889 Jan. 2.      | N.R. | Dudgeon, Gerald Cecil, Lebong Tea Company. <i>Darjeeling.</i>                                               |
| 1879 Feb. 5.      | N.R. | Duthie, J. F., Director, Government Botanical Survey, Northern India. <i>Saharanpur.</i>                    |
| 1877 Aug. 30.     | N.R. | Dutt, Kedarnáth, Depy. Collector. <i>Cuttack.</i>                                                           |
| 1890 Sept. 25.    | N.R. | Dutt, Romesh Chunder, B. C. S., Barrister at-Law, Middle Temple, Magistrate and Collector. <i>Dinajpur.</i> |
| 1870 Mar. 9.      | L.M. | Edinburgh, H. R. H. The Duke of. <i>Europe.</i>                                                             |
| 1871 Dec. 2.      | N.R. | Eliot, J., M. A., Meteorological Reporter to the Govt. of India. <i>Simla.</i>                              |
| 1886 Jan. 6.      | R.   | Elson, Samuel R. Bengal Pilot Service. <i>Calcutta.</i>                                                     |
| 1876 Jan. 5.      | F.M. | Feistmantel, Ottokar, M. D. <i>Europe.</i>                                                                  |
| 1879 July 2.      | R.   | Finucane, M. c. s., Director of Agriculture, Bengal. <i>Calcutta.</i>                                       |
| 1869 Sept. 1.     | A.   | Fisher, John Hadden, c. s. <i>Europe.</i>                                                                   |
| 1886 April 7.     | N.R. | Fleet, John Faithfull, C. I. E., c. s. <i>Bijapur, Bombay.</i>                                              |
| 1876 July 5.      | N.R. | Foulkes, The Rev. Thos., F. L. S., M. R. A. S., F. R. G. S. <i>Salem, Madras Presidency.</i>                |
| 1880 April 7.     | N.R. | Gajapati, Ananda Rám, K. C. I. E., Rájá of Vizianagram. <i>Vizianagram.</i>                                 |
| 1873 Dec. 3.      | N.R. | Gamble, J. S., M. A., Conservator of Forests. <i>Dehra Dún.</i>                                             |
| 1859 Aug. 3.      | L.M. | Gastrell, General James Eardley. <i>Europe.</i>                                                             |
| 1867 Dec. 4.      | A.   | Gay, E., M. A., F. R. A. S. <i>Europe.</i>                                                                  |
| 1889 Jan. 2.      | R.   | Ghose, Jogendrachandra, M. A., B. L. <i>Calcutta.</i>                                                       |
| 1883 Aug. 30.     | R.   | Ghose, Manmohan. <i>Calcutta.</i>                                                                           |

| Date of Election. |      |                                                                                                                                                                                                                    |
|-------------------|------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1889 Mar. 6.      | R.   | Ghosh, Bhupendra Sri. <i>Calcutta.</i>                                                                                                                                                                             |
| 1869 Feb. 3.      | R.   | Ghosh, Pratápchandra, B. A. <i>Calcutta.</i>                                                                                                                                                                       |
| 1884 Dec. 3.      | N.R. | Giles, George, M. J., M. B., F. R. C. S., Civil Medical Officer, Lawrence Military Asylum. <i>Sanawar.</i>                                                                                                         |
| 1886 Sept. 30.    | N.R. | Gimlette, George Hart Desmond, Surgeon, Bengal Medical Service, M. D., M. CH., M. R. C. S., L. S. A. Goona Political Agency. <i>Central India.</i>                                                                 |
| 1861 Feb. 5.      | N.S. | Godwin-Austen, Lieut.-Colonel H. H., F. R. S., F. Z. S., F. R. G. S. <i>Europe.</i>                                                                                                                                |
| 1890 Aug. 6.      | R.   | Goethals, S. J., The Most Rev. Dr. Paul, Archbishop of Calcutta.                                                                                                                                                   |
| 1882 May 3.       | R.   | Golám Sarwar, Maulavi. <i>Calcutta.</i>                                                                                                                                                                            |
| 1881 Mar. 2.      | R.   | Gosáin, Hem Chunder. <i>Calcutta.</i>                                                                                                                                                                              |
| 1876 Nov. 15.     | N.R. | Grierson, George Abraham, C. S. <i>Gya.</i>                                                                                                                                                                        |
| 1885 Dec. 2.      | N.R. | Griesbach, C. L., C. I. E., F. G. S., Deputy Superintendent, Geological Survey of India.                                                                                                                           |
| 1861 Feb. 6.      | N.R. | Growse, Frederick Salmon, C. I. E., M. A., C. S., Magistrate and Collector. <i>Farukhabad, N.-W. P.</i>                                                                                                            |
| 1886 Mar. 3.      | N.R. | Gupta, Asutosh, C. S., Assistant Magistrate and Collector. <i>Mymensing.</i>                                                                                                                                       |
| 1888 July 4.      | R.   | Gupta, Rajanikánta. <i>Calcutta.</i>                                                                                                                                                                               |
| 1889 June 5.      | F.M. | Hamilton, Rev. Walter A., Chaplain, Bengal Establishment. <i>Europe.</i>                                                                                                                                           |
| 1883 Jan. 3.      | A.   | Harding, Francis Henry, B. A., C. S. <i>Europe.</i>                                                                                                                                                                |
| 1890 June 4.      | R.   | Heilgers, Robert Philip, Consul for H. I. M. the Emperor of Austria and Hungary, Knight of the Imperial Order of the Iron Crown, Commandeur Ordre Impériale de Medjidié, F. R. G. S., F. R. S. S. <i>Calcutta.</i> |
| 1875 Mar. 3.      | N.R. | Hendloy, Surgeon Major Thomas Holbein, C. I. E. <i>Jeyjore.</i>                                                                                                                                                    |
| 1890 April 2.     | R.   | Hickson, F. G. <i>Calcutta.</i>                                                                                                                                                                                    |
| 1872 Dec. 5.      | A.   | Hoernle, A. F. R., PH. D., Principal of the Calcutta Madrasa. <i>Europe.</i>                                                                                                                                       |
| 1878 Mar. 6.      | N.R. | Hoey, W., C. S. <i>Banda.</i>                                                                                                                                                                                      |
| 1886 June 2.      | A.   | Hogg, Alexander. <i>Europe.</i>                                                                                                                                                                                    |
| 1884 Mar. 5.      | N.R. | Hooper, John, C. S., Settlement Officer. <i>Dasti, N.-W. P.</i>                                                                                                                                                    |
| 1873 Jan. 2.      | L.M. | Houstoun, G. L., F. G. S. <i>Europe.</i>                                                                                                                                                                           |
| 1863 Jan. 15.     | N.R. | Howell, Mortimer Sloper, C. S., C. I. E. <i>Shahjahanpur.</i>                                                                                                                                                      |
| 1878 Sept. 25.    | N.R. | Hughes, G., C. S., Deputy Commissioner. <i>Ludhiana.</i>                                                                                                                                                           |
| 1867 Aug. 7.      | N.R. | Hughes, T. W. H., A. R. S. M., F. G. S., Superintendent, Geological Survey of India.                                                                                                                               |
| 1870 Jan. 5.      | N.R. | Hume, Allan Octavian, C. B., C. S. <i>Simla.</i>                                                                                                                                                                   |
| 1884 May 2.       | N.R. | Hussein, Syud, B. A., Secy. to Nizam of Hyderabad's Council. <i>Hyderabad.</i>                                                                                                                                     |
| 1890 Dec. 3.      | R.   | Hyde, Rev. Henry Barry, M. A., Bengal Ecclesiastical Establishment. <i>Calcutta.</i>                                                                                                                               |

| Date of Election. |      |                                                                                                                                                               |
|-------------------|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1872 Dec. 4.      | N.R. | Ibbetson, Denzil Charles Jelf, c. s. Deputy Commissioner. <i>Gujranwala, Panjab.</i>                                                                          |
| 1866 Mar. 7.      | F.M. | Irvine, William c. s. <i>Europe.</i>                                                                                                                          |
| 1884 May 2.       | N.R. | Iskander Ali Mirza, Prince. <i>Murshedabad.</i>                                                                                                               |
| 1880 Dec. 1.      | A.   | Jackson, William Grierson, c. s. <i>Europe.</i>                                                                                                               |
| 1869 Aug. 4.      | R.   | Jahán Qadr Muhammad Wáhid Ali, Bahádur, Prince. <i>Garden Reach, Calcutta.</i>                                                                                |
| 1879 Mar. 5.      | R.   | Jarrett, Lt.-Col. H. S., B. S. C., Secy. to the Board of Examiners. <i>Calcutta.</i>                                                                          |
| 1881 Feb. 2.      | N.R. | Jenkins, Major Thomas Morris, M. S. C. Deputy Commissioner. <i>Tavoy.</i>                                                                                     |
| 1889 Mar. 6.      | R.   | Jobbins, William Henry, Principal, Government School of Art. <i>Calcutta.</i>                                                                                 |
| 1873 Dec. 3.      | N.R. | Johore, H. H. the Maharájá of, K. C. S. I. <i>New Johore, Singapore.</i>                                                                                      |
| 1882 Mar. 1.      | N.R. | Kennedy, Pringle, M. A. <i>Mozufferpur.</i>                                                                                                                   |
| 1874 Dec. 2.      | N.R. | Khudá Baksh, Khán Bahádur, Maulavi. <i>Bankipur.</i>                                                                                                          |
| 1884 Nov. 5.      | N.R. | Kitts, Eustace John, c. s. <i>Moradabad.</i>                                                                                                                  |
| 1867 Dec. 4.      | R.   | King, Brigade Surgeon G. C. I. E., M. B., F. L. S., Supdt., Royal Botanic Garden. <i>Sibpur.</i>                                                              |
| 1881 Mar. 2.      | N.R. | King, Lucas White, B. A., LL. B., C. S., Deputy Commissioner. <i>Dehra Ismail Khan.</i>                                                                       |
| 1862 Jan. 15.     | R.   | King, W., B. A., D. Sc., Director, Geological Survey of India. <i>Calcutta.</i>                                                                               |
| 1889 Mar. 6.      | R.   | Khunnah, Jagánath. <i>Calcutta.</i>                                                                                                                           |
| 1890 April 2.     | N.R. | Lake, Philip, B. A., (Cantab.), Geological Survey of India.                                                                                                   |
| 1889 July 3.      | N.R. | Lal, Pandit Brij Bukhan. Public Works Department. <i>Kurnal, Punjab.</i>                                                                                      |
| 1887 May 4.       | L.M. | Lanman, Charles R. Corresponding Secretary of the American Oriental Society, Professor of Sanskrit in Harvard College. <i>Cambridge, Mass. U. S. America.</i> |
| 1877 Sep. 27.     | N.R. | La Touche, James John Digges, B. A., C. S., Collector and Magistrate. <i>Aligarh.</i>                                                                         |
| 1889 Mar. 6.      | N.R. | La Touche, Thomas Henry Digges, M. A. Deputy Superintendent, Geological Survey of India.                                                                      |
| 1889 Nov. 6.      | R.   | Lee, W. A. <i>Calcutta.</i>                                                                                                                                   |
| 1881 Mar. 2.      | N.R. | Lee, J. Bridges, M. A., F. G. S., F. C. S., F. Z. S., Barrister-at-Law. <i>Lahore.</i>                                                                        |
| 1888 Feb. 1.      | N.R. | Lee, William Herbert, c. s. <i>Sylhet.</i>                                                                                                                    |
| 1880 July 7.      | A.   | Lewis, Rev. Arthur, B. A. <i>Europe.</i>                                                                                                                      |
| 1889 Feb. 6.      | R.   | Little, C., M. A., Bengal Education Department. <i>Calcutta.</i>                                                                                              |
| 1886 Sep. 30      | R.   | Luson, Hewling, c. s., Under Secretary Government of Bengal. <i>Calcutta.</i>                                                                                 |

| Date of Election. |      |                                                                                                    |
|-------------------|------|----------------------------------------------------------------------------------------------------|
| 1869 July 7.      | R.   | Lyall, Charles James, B. A., C. S., Secretary Government of India, II. D. <i>Calcutta.</i>         |
| 1870 April 7.     | L.M. | Lyman, B. Smith. <i>Philadelphia, Pa., U. S., America.</i>                                         |
| 1884 Dec. 3.      | N.R. | McCabe, R. B., C. S., Deputy Commissioner. <i>Tezpur, Assam.</i>                                   |
| 1868 Dec. 2.      | N.R. | Macauliffe, Michael, B. A., C. S., Divisional Judge. <i>Sialkot.</i>                               |
| 1879 Feb. 5.      | N.R. | Macgregor, Lieut.-Col. C. R., F. R. G. S., 1st Burma Infantry. <i>Mandalay.</i>                    |
| 1848 April 5.     | L.M. | MacLagan, General Robert, R. E., LL. D., F. R. S. E., F. R. G. S. <i>Europe.</i>                   |
| 1873 Dec. 3.      | R.   | MacLeod, Kenneth, M. D., Brigade Surgeon. <i>Calcutta.</i>                                         |
| 1880 May 5.       | N.R. | MacLeod, Roderick Henry, C. S. Asst. Magte <i>Kasia, Gorakhpur, N.-W. P.</i>                       |
| 1881 July 6.      | R.   | Mahomed Firukh Sháh, Prince. <i>Calcutta.</i>                                                      |
| 1886 Jan. 6.      | N.R. | Mahomed Iatíf Khán, Sayyid, Khán Bahádúr. <i>Jhang. Panjab.</i>                                    |
| 1882 Aug. 2.      | R.   | Mahomed Yusoof, Hon. Maulavi. <i>Calcutta.</i>                                                     |
| 1888 July 4.      | N.R. | Mahomed Zainool Abideen Khán Bahádúr Feroze Jung, Nawab Syud (Nizamut Family). <i>Murshedabad.</i> |
| 1867 April 3.     | R.   | Mainwaring, Lieutenant-General George Byres, S. C. <i>Serampur.</i>                                |
| 1889 Jan. 2.      | R.   | Maliáh, Kumár Rameswár. <i>Calcutta.</i>                                                           |
| 1869 Sept. 1.     | R.   | Mallik, Yadulál. <i>Calcutta.</i>                                                                  |
| 1889 Mar. 6.      | R.   | Mann, John, M. A. Bengal Education Department. <i>Hughli.</i>                                      |
| 1869 July 7.      | N.R. | Markham, Alexander Macaulay, C. S., F. R. G. S., Divisional Judge. <i>Meerut.</i>                  |
| 1886 Aug. 26.     | N.R. | Mende, Capt. Malcolm John, S. C., Political Agent. <i>Bhopawar.</i>                                |
| 1860 Mar. 7.      | A.   | Medlicott, H. B., M. A., F. R. S., F. G. S. <i>England.</i>                                        |
| 1886 Mar. 3.      | L.M. | Mehtá, Rustumjee Dhunjeebhoy. <i>Calcutta.</i>                                                     |
| 1884 Nov. 5.      | N.R. | Middlemiss, C. S., A. B., Assistant Superintendent, Geological Survey of India.                    |
| 1871 Sept 6.      | N.R. | Miles, Colonel S. B., B. S. C., Political Agent. <i>Oodeypur.</i>                                  |
| 1884 Sept. 3.     | R.   | Miles, William Harry. <i>Calcutta.</i>                                                             |
| 1870 July 6.      | R.   | Miller, A. B., B. A., Barrister-at-Law, Official Trustee. <i>Calcutta.</i>                         |
| 1874 May 6.       | N.R. | Minchin, F. J. V. <i>Aska, Ganjam.</i>                                                             |
| 1856 Mar. 5.      | R.   | Mitra, Rájá Rájendralála, LL. D., C. I. E. <i>Calcutta.</i>                                        |
| 1890 Dec. 3.      | N.R. | Mitra, Varana Charana. Joint Magistrate. <i>Begusarai, Monghyr.</i>                                |
| 1876 Dec. 6.      | N.R. | Mockler, Col. E., Political Agent. <i>Muscat.</i>                                                  |
| 1886 May 5.       | A.   | Molesworth, Capt. E. H. Commandant, Police Levy, <i>Debrugarh. Europe.</i>                         |



| Date of Election. |      |                                                                                                          |
|-------------------|------|----------------------------------------------------------------------------------------------------------|
| 1881 May 4.       | A.   | Molloy, Lieut.-Col. Edward, 5th Goorkhas. <i>Europe.</i>                                                 |
| 1864 Nov. 2.      | N.R. | Muir, J. W., M. A., C. S. <i>Azimgarh.</i>                                                               |
| 1879 May 7.       | R.   | Mukerjea, Bhudeva, C. I. E. <i>Calcutta.</i>                                                             |
| 1867 Mar. 6.      | R.   | Mukerjea, Rájá, The Hon. Pearinohan, C. S. I., M. A. <i>Uttarpara.</i>                                   |
| 1885 July 1.      | R.   | Mukerjea, Nilmani, Professor, Sanskrit College. <i>Calcutta.</i>                                         |
| 1890 July 2.      | R.   | Mukharji, T. N. <i>Calcutta.</i>                                                                         |
| 1886 May 5.       | R.   | Mukhopádhyaýa, Asutosh, M. A., F. R. A. S., F. R. S. E. <i>Calcutta.</i>                                 |
| 1887 May 4.       | R.   | Munro, Thomas R., Port Commissioners Department. <i>Calcutta.</i>                                        |
| 1885 June 3.      | N.R. | Naomwoollah, Maulavi, Depy. Magte. <i>Bulandshahr.</i>                                                   |
| 1887 June 1.      | N.R. | Narain, Ráo Govind Ráo. <i>Allahabad.</i>                                                                |
| 1876 May 4.       | R.   | Nash, A. M., M. A., Inspector of European Schools, Bengal. <i>Calcutta.</i>                              |
| 1881 Nov. 2.      | R.   | Nicóville, L. de., F. E. S. <i>Calcutta.</i>                                                             |
| 1889 Aug. 29.     | L.M. | Nimmo, John Duncan. <i>Calcutta.</i>                                                                     |
| 1887 April 6.     | R.   | Noetling, Fritz, Ph. D. Palaeontologist to the Geological Survey of India. <i>Calcutta.</i>              |
| 1869 July 7.      | N.R. | Nursing Ráo, A. V., Ráo Bahádur, F. R. A. S. <i>Vizagapatam.</i>                                         |
| 1885 Feb. 4.      | R.   | Nyáyaratua, Pandit Mahámahopádhyaýa Mahes-chandra, C. I. E. <i>Calcutta.</i>                             |
| 1879 Aug. 28.     | F.M. | Oldham, Brigade-Surgeon, C. F., F. R. G. S. <i>Europe.</i>                                               |
| 1883 Dec. 1.      | N.R. | Oldham, R. D., A. R. S. M., F. G. S., Deputy Superintendent, Geological Survey of India.                 |
| 1883 Aug. 30.     | N.R. | Oliver, Edw. Emmerson, M. I. C. E. <i>Lahore.</i>                                                        |
| 1885 Feb. 4.      | N.R. | Oliver, James William, Forest Dept. <i>Burmah.</i>                                                       |
| 1887 July 6.      | R.   | Oung, Moung Hla, Financial Department, Government of India. <i>Calcutta.</i>                             |
| 1880 Aug. 4.      | L.M. | Pandia, Pandit Mohanálál Vishnulál, F. T. S., Member and Secy., Royal Council of Meywar. <i>Udaipur.</i> |
| 1889 Feb. 1.      | L.M. | Pandit, Hon. Ajodhianath. <i>Allahabad.</i>                                                              |
| 1880 Jan. 7.      | N.R. | Pargiter, Frederick, E., B. A., C. S. <i>Rajshahye.</i>                                                  |
| 1862 May 7.       | L.M. | Partridge, Samuel Bowen, M. D., Surgeon-Major. <i>Europe.</i>                                            |
| 1871 Dec. 6.      | N.R. | Peal, S. E. <i>Sibsagar, Assam.</i>                                                                      |
| 1873 Aug. 6.      | R.   | Pedler, Alexander, F. C. S., Professor of Chemistry, Presidency College. <i>Calcutta.</i>                |
| 1888 June 6.      | L.M. | Pennell, Aubray Percival, B. A., C. S. <i>Burma.</i>                                                     |
| 1865 Sept. 6.     | N.R. | Poppé, T. F. Tiril Tea Estate. <i>Ranchi, Lohardugga.</i>                                                |

| Date of Election. |      |                                                                                                      |
|-------------------|------|------------------------------------------------------------------------------------------------------|
| 1881 Aug. 25.     | R.   | Percival, Hugh Melville, M. A., Professor, Presidency College. <i>Calcutta.</i>                      |
| 1877 Aug. 1.      | N.R. | Peters, C. T., M. B., Surgeon Major. <i>Bijapur, Bombay.</i>                                         |
| 1889 Nov. 6.      | N.R. | Phillott, Capt. D. C., Adjutant 3rd Panjab Cavalry. <i>Dera Ismail Khan.</i>                         |
| 1890 Mar. 5.      | N.R. | Pilcher, Jesse Griggs, Deputy Surgeon General. <i>Nagpur.</i>                                        |
| 1889 Mar. 6.      | R.   | Prain, David, M. A., M. B., L. R. C. S., I. R. S. E., I. L. S., Royal Botanic Garden. <i>Sibpur.</i> |
| 1889 Mar. 6.      | N.R. | Prasad, Hanuman, Raes and Zemindar. <i>Ohunar.</i>                                                   |
| 1889 Nov. 6.      | N.R. | Prasada, Pandit Jwála, M. A., Assistant Commissioner. <i>Rai Bareli.</i>                             |
| 1881 Feb. 2.      | N.R. | Prideaux, Colonel William Francis, B. S. C., Resident. <i>Kashmir.</i>                               |
| 1880 April 7.     | N.R. | Rai, Bipina Chandra, B. L. <i>Rannaghat, Nuddra.</i>                                                 |
| 1887 May 4.       | A.   | Ráy, Prasannakumár, D. Sc., (Lond. and Edin.) Professor, Presidency College. <i>Europe.</i>          |
| 1889 June 5.      | R.   | Raye, Brigade Surgeon Daniel O'Connell, M. D. <i>Calcutta.</i>                                       |
| 1880 Aug. 4.      | N.R. | Reynolds, Herbert William Ward, c. s. <i>Mirzapur.</i>                                               |
| 1884 Mar. 5.      | R.   | Risley, H. H., B. A., C. S. <i>Calcutta.</i>                                                         |
| 1860 Jan. 3.      | N.R. | Rivett-Carnac, John Henry, C. I. E., F. S. A., C. S., Opium Agent. <i>Ghazipur.</i>                  |
| 1889 June 5.      | A.   | Rowe, F. J., M. A., Bengal Education Department. <i>Europe.</i>                                      |
| 1888 July 4.      | N.R. | Roy, Kirán Chándra, Zemindar. <i>Narail, Jessore.</i>                                                |
| 1888 June 6.      | R.   | Roy, Kumár Denendro Náráyan. <i>Calcutta.</i>                                                        |
| 1890 Mar. 5.      | N.R. | Roy, Mahárájá Girjanath. <i>Dinajpur.</i>                                                            |
| 1888 June 6.      | R.   | Roy, Peary Mohun. <i>Calcutta.</i>                                                                   |
| 1888 Sep. 27.     | N.R. | Roy, Upendra Chándra, Zemindar. <i>Narail, Jessore.</i>                                              |
| 1885 Mar. 4.      | R.   | Rustomjee, H. M. <i>Calcutta.</i>                                                                    |
| 1889 June 5.      | N.R. | Sadler, Major J. Hayes, B. S. C. <i>Baroda.</i>                                                      |
| 1880 Sep. 30.     | A.   | Sage, E. M., Ex. Engineer, P. W. D. <i>Europe.</i>                                                   |
| 1890 Dec. 3.      | N.R. | Samuells, C. A., c. s. <i>Mahlah.</i>                                                                |
| 1887 June 1.      | A.   | Sandberg, Rev. Graham, B. A., Barrister-at-Law, Inner Temple. Chaplain. <i>Europe.</i>               |
| 1872 Dec. 4.      | R.   | Sarasvati, Pandit, Pránáth, M. A., B. L. <i>Bhowanipur.</i>                                          |
| 1867 April 3.     | R.   | Sarkár, the Hon. Dr. Mahendralál, C. I. E. <i>Calcutta.</i>                                          |
| 1885 Mar. 4.      | R.   | Sarvādhikāri, Rāj Kumār, Rai Bahādur. <i>Calcutta.</i>                                               |
| 1885 Feb. 4.      | R.   | Sāstri, Pandit Haraprasād, M. A. <i>Calcutta.</i>                                                    |
| 1888 Feb. 1.      | R.   | Sclater, William Lutley, Deputy Superintendent, Indian Museum. <i>Calcutta.</i>                      |
| 1884 April 2.     | N.R. | Scotland, John Parry, C. E., Ex. Engineer. <i>Midnapur.</i>                                          |

| Date of Election. |      |                                                                                                                          |
|-------------------|------|--------------------------------------------------------------------------------------------------------------------------|
| 1874 July 1.      | R.   | Scully, Dr. John. <i>Calcutta.</i>                                                                                       |
| 1888 Sept. 27.    | R.   | Sen, Gupta, Kali Prasanna. <i>Calcutta.</i>                                                                              |
| 1886 Mar. 3.      | N.R. | Sen, Hirálal, Excise Department. <i>Gya.</i>                                                                             |
| 1885 April 1.     | N.R. | Sen, Yadunáth. <i>Khurda, Puri.</i>                                                                                      |
| 1885 April 1.     | R.   | Sen, Narendranáth. <i>Calcutta.</i>                                                                                      |
| 1879 Jan. 8.      | N.R. | Sewell, R., M. C. S. <i>Madras.</i>                                                                                      |
| 1879 May 7.       | A.   | Sheridan, C. J., C. E. <i>Europe.</i>                                                                                    |
| 1888 April 4.     | N.R. | Shástri, Haridas Bhattácharya, Sankhya Shastri, M. A. Director of Public Instruction, Jaypur State. <i>Jaypur.</i>       |
| 1882 May 3.       | N.R. | Shyamadáś, Mahámahopadhyáya Kaviráj, Private Secy. to H. H. the Mahárájá of Udaipur. <i>Udaipur.</i>                     |
| 1878 April 3.     | R.   | Simson, A. <i>Calcutta.</i>                                                                                              |
| 1887 April 6.     | R.   | Simpson, Dr. W. J., Health Officer to the Municipal Corporation. <i>Calcutta.</i>                                        |
| 1889 Nov. 6.      | N.R. | Simpson, Edmund James, L. R. C. P. E., F. L. P. S. G., L. M. G. E., Civil Surgeon. <i>Rai Bareilly.</i>                  |
| 1884 Sept. 3.     | R.   | Singh, Kumár Indrachandra, of Paikparah. <i>Calcutta.</i>                                                                |
| 1882 June 7.      | N.R. | Singh, Mahárájá Sir Harendra Kishore, K. C. I. E. <i>Belliah.</i>                                                        |
| 1890 Sept. 25.    | R.   | Singh, Kumar Sarat Chandra. <i>Calcutta.</i>                                                                             |
| 1878 Oct. 4.      | N.R. | Singh, Rájá Lachman. <i>Agra.</i>                                                                                        |
| 1882 Aug. 2.      | N.R. | Singh, Narain, Rájá Rám. <i>Khyrah, Monghyr.</i>                                                                         |
| 1880 June 2.      | N.R. | Singh, Thákur Garuradhwaya Prasád, Rájá of Beswan, Beswan Fort. <i>Aligarh.</i>                                          |
| 1890 Jan. 1.      | N.R. | Singh, Thakur Soorj Bakhsh, Zemindar. <i>Silapur, Oudh.</i>                                                              |
| 1889 Aug. 29.     | N.R. | Singh, H. H. Prabhunarain, Bahádur, Mahárájá of Benares.                                                                 |
| 1889 Nov. 6.      | N.R. | Singh, Hon. Rájá Rameshwara, Bahádur, <i>Darbhanga.</i>                                                                  |
| 1859 Aug. 3.      | R.   | Sinha, Baláichánd. <i>Calcutta.</i>                                                                                      |
| 1872 Aug. 5.      | N.R. | Skrofsrud, Rev. L. O., Indian Home Mission to the Santháls. <i>Rampur Hat.</i>                                           |
| 1885 Nov. 4.      | A.   | Smith, N. F. F. <i>England.</i>                                                                                          |
| 1874 June 3.      | N.R. | Smith, Vincent Arthur, C. S., Collector. <i>Mozuffarnagar.</i>                                                           |
| 1890 April 2.     | A.   | Solf, Dr. W. H., German Consulate General. <i>Europe.</i>                                                                |
| 1872 July 3.      | N.R. | Stephen, Carr, B. L. <i>Lahore.</i>                                                                                      |
| 1876 Aug. 2.      | N.R. | St. John, Lieut.-Col. Sir Oliver Beauchamp, R. E., K. C. S. I., Resident in Mysore and Chief Commissioner. <i>Coorg.</i> |
| 1880 Nov. 3.      | A.   | Sturt, Lieut. Robert Ramsay Napier, B. S. C., Panjab Frontier Force. <i>Europe.</i>                                      |
| 1884 Mar. 5.      | A.   | Swinhoe, Lieut.-Col. C., B. S. C. <i>Europe.</i>                                                                         |
| 1864 Aug. 11.     | R.   | Swinhoe, W., Attorney-at-Law. <i>Calcutta.</i>                                                                           |

| Date of Election. |      |                                                                                                                                                |
|-------------------|------|------------------------------------------------------------------------------------------------------------------------------------------------|
| 1880 Nov. 3.      | A.   | Swynnerton, Rev. Charles. <i>England.</i>                                                                                                      |
| 1868 June 3.      | R.   | Tagore, The Hon. Mahārājā Sir Jotendra Mohun, Bahādūr, K. C. S. I. <i>Calcutta.</i>                                                            |
| 1865 Sept. 6.     | R.   | Tawney, C. H., C. I. E., M. A., Principal, Presidency College. <i>Calcutta.</i>                                                                |
| 1884 May 5.       | N.R. | Taylor, W. C., Settlement Officer. <i>Khurda.</i>                                                                                              |
| 1878 June 5.      | N.R. | Temple, Capt. R. C., s. c. <i>Palace, Mandalay, Burma.</i>                                                                                     |
| 1875 June 2.      | N.R. | Thibaut, Dr. G., Professor, Muir Central College. <i>Allahabad.</i>                                                                            |
| 1886 Aug. 4.      | R.   | Thomas, Robert Edmond Skyring. <i>Calcutta.</i>                                                                                                |
| 1886 Jan. 6.      | A.   | Thompson, Colonel, W. B., B. S. C. <i>Europe.</i>                                                                                              |
| 1847 June 2.      | L.M. | Thuillier, Major-Genl. Sir Henry Edward Landor, R. A., C. S. I., F. R. S. <i>Europe.</i>                                                       |
| 1889 Mar. 6.      | R.   | Thuillier, Colonel H. R., R. E., Surveyor General of India. <i>Calcutta.</i>                                                                   |
| 1871 April 5.     | F.M. | Trefftz, Oscar. <i>Europe.</i>                                                                                                                 |
| 1861 June 5.      | L.M. | Tremlett, James Dyer, M. A., C. S., Judge, Chief Court. <i>Lahore.</i>                                                                         |
| 1890 Feb. 5.      | N.R. | Venis, Arthur, M. A., Former Boden Sanskrit scholar, Oxford, Principal, Sanskrit College, Benares. Professor, Queen's College. <i>Benares.</i> |
| 1885 May 6.       | R.   | Verdeau, Ivan. <i>Calcutta.</i>                                                                                                                |
| 1886 Sep. 30.     | N.R. | Waddell, Dr. Laurence Austine, M. B., Superintendent of Vaccination. <i>Darjeeling.</i>                                                        |
| 1889 Nov. 6.      | R.   | Walsh, J. H. Tull, Indian Medical Service. General Hospital. <i>Calcutta.</i>                                                                  |
| 1865 May 3.       | R.   | Waterhouse, Col. James, B. S. C., Dy. Supdt., Survey of India. <i>Calcutta.</i>                                                                |
| 1887 Oct. 6.      | N.R. | Watson, Lieut. Edward Yerbury, Deputy Assistant Commissary General. <i>Burma.</i>                                                              |
| 1874 July 1.      | N.R. | Watt, Dr. George, C. I. E., Reporter on Economic Products. <i>Simla.</i>                                                                       |
| 1869 Sept. 1.     | A.   | Westland, Hon. James, C. S. <i>Europe.</i>                                                                                                     |
| 1880 Feb. 4.      | R.   | Wilson, The Hon. Arthur, Judge High Court. <i>Calcutta.</i>                                                                                    |
| 1870 Jan. 5.      | R.   | Wood-Mason, James. Superintendent, Indian Museum. <i>Calcutta.</i>                                                                             |
| 1873 Aug. 6.      | N.R. | Woodthorpe, Col. Robert Gossett, C. B., R. E., Deputy Quarter-Master-General. <i>Simla.</i>                                                    |

## SPECIAL HONORARY CENTENARY MEMBERS.

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| Date of Election. |                                                                                                                                       |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| 1884 Jan. 15.     | Dr. Ernst Haeckel, Professor in the University of <i>Jena</i> .                                                                       |
| 1884 Jan. 15.     | Charles Meldrum, Esq., M. A., F. R. S. <i>Mauritius</i> .                                                                             |
| 1884 Jan. 15.     | A. H. Sayce, Esq., Professor of Comp. Philology. <i>Oxford</i> .                                                                      |
| 1884 Jan. 15.     | M. Emile Souart, Member of the Institute of France.<br><i>Paris</i> .                                                                 |
| 1884 Jan. 15.     | Sir Monier Monier-Williams, <i>Knt.</i> , K. C. I. E., C. I. E., M. A.,<br>D. C. L., LL. D., Boden Prof. of Sanskrit. <i>Oxford</i> . |

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## HONORARY MEMBERS.

|               |                                                                                               |
|---------------|-----------------------------------------------------------------------------------------------|
| 1848 Feb. 2.  | Sir J. D. Hooker, K. C. S. I., C. B., M. D., D. C. L., F. R. S.,<br>F. G. S. <i>Kew</i> .     |
| 1853 April 6. | Major-General H. C. Rawlinson, K. C. B., D. C. L., F. R. S.,<br><i>London</i> .               |
| 1858 July 6.  | B. H. Hodgson. <i>Europe</i> .                                                                |
| 1860 Mar. 7.  | Professor Max Müller. <i>Oxford</i> .                                                         |
| 1860 Nov. 7.  | Dr. Aloys Sprenger. <i>Heidelberg</i> .                                                       |
| 1860 Nov. 7.  | Dr. Albrecht Weber. <i>Berlin</i> .                                                           |
| 1868 Feb. 5.  | Major-General Sir A. Cunningham, R. E., K. C. I. E., C. S. I.,<br>C. I. E. <i>Europe</i> .    |
| 1872 May 1.   | Sir G. B. Airy, K. C. B., M. A., D. C. L., LL. D., F. R. S. <i>London</i> .                   |
| 1872 June 5.  | Prof. T. H. Huxley, LL. D., PH. D., F. R. S., F. G. S., F. Z. S.,<br>F. L. S. <i>London</i> . |
| 1875 Nov. 3.  | Dr. O. Böhtlingk. <i>Leipzig</i> .                                                            |
| 1875 Nov. 3.  | Prof. J. O. Westwood. <i>Oxford</i> .                                                         |
| 1876 April 5. | Dr. Warner Siemens. <i>Berlin</i> .                                                           |
| 1879 June 4.  | Prof. H. B. Cowell, D. C. L. <i>Cambridge</i> .                                               |
| 1879 June 4.  | Dr. A. Günther, V. P. R. S. <i>London</i> .                                                   |
| 1879 June 4.  | Dr. J. Janssen. <i>Paris</i> .                                                                |
| 1879 June 4.  | Prof. H. Milne-Edwards. <i>Paris</i> .                                                        |
| 1879 June 4.  | Prof. P. Regnaud. <i>Lyons</i> .                                                              |
| 1879 June 4.  | E. Renan. <i>Paris</i> .                                                                      |
| 1881 Dec. 7.  | Professor Hermann L. E. Helmholtz. <i>Berlin</i> .                                            |
| 1881 Dec. 7.  | Dr. Rudolph v. Roth. <i>Tübingen</i> .                                                        |
| 1881 Dec. 7.  | Sir William Thompson, <i>Knt.</i> , LL. D., F. R. S., F. R. S. E.,<br><i>Glasgow</i> .        |
| 1883 Feb. 7.  | W. T. Blanford, A. R. S. M., F. R. S., F. G. S., F. R. G. S.,<br>F. Z. S. <i>London</i> .     |
| 1883 Feb. 7.  | Alfred Russell Wallace, F. L. S., F. R. G. S. <i>Parkstone</i> ,<br><i>Dorsetshire</i> .      |
| 1883 Feb. 7.  | Prof. William Dwight Whitney. <i>Newhaven, Connecticut</i> ,<br>U. S. A.                      |

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## CORRESPONDING MEMBERS.

| Date of Election. |    |                                             |
|-------------------|----|---------------------------------------------|
| 1844 Oct.         | 2. | Macgowan, Dr. J. <i>Europe.</i>             |
| 1856 July         | 2. | Krämer, A. von. <i>Alexandria.</i>          |
| 1856 „            | 2. | Porter, Rev. J. <i>Belfast.</i>             |
| 1860 Feb.         | 1. | Baker, The Rev. H. <i>E. Malabar.</i>       |
| 1861 July         | 3. | Gösche, Dr. R. <i>Berlin.</i>               |
| 1862 Mar.         | 3. | Murray, A., Esq. <i>London.</i>             |
| 1866 May          | 7. | Schlagintweit, Prof. E. von. <i>Berlin.</i> |

## ASSOCIATE MEMBERS.

|            |    |                                                       |
|------------|----|-------------------------------------------------------|
| 1874 April | 1. | Lafont, Rev. Fr. E., s. J., c. i. e. <i>Calcutta.</i> |
| 1875 Dec.  | 1. | Bate, Rev. J. D. <i>Allahabad.</i>                    |
| 1875 „     | 1. | Maulavi Abdul Hai, Madrasah. <i>Calcutta.</i>         |
| 1882 June  | 7. | Giles, Herbert, Esq. <i>Europe.</i>                   |
| 1883 Feb.  | 7. | Rodgers, C. J. <i>Amritsar.</i>                       |
| 1884 Aug.  | 6. | Moore, F., F. R. S., F. L. S. <i>London.</i>          |
| 1885 Dec.  | 2. | Führer, Dr. A. <i>Lucknow.</i>                        |
| 1886 Dec.  | 1. | Bábú Saratchandra Dás, c. i. e. <i>Darjeeling.</i>    |

## LIST OF MEMBERS WHO HAVE BEEN ABSENT FROM INDIA THREE YEARS AND UPWARDS.\*

\* *Rule 40.*—After the lapse of 3 years from the date of a member leaving India, if no intimation of his wishes shall in the interval have been received by the Society, his name shall be removed from the List of Members.

The following members will be removed from the next member list of the Society under the operation of the above Rule :

A. C. Carlleyle, Esq.  
H. B. Medlicott, Esq.  
E. M. Sage, Esq.  
C. J. Sheridan, Esq.  
Colonel W. B. Thompson, B. s. c.  
Hon. J. Westland, c. s.

## LOSS OF MEMBERS DURING 1890.

### BY RETIREMENT.

A. F. M. Abdur Rahmán.  
 H. H. Anderson, Esq.  
 Rev. A. W. Atkinson.  
 R. R. Bayne, B. A., M. R. I.  
 I. C. Bose.  
 J. W. Chambers, Esq.  
 Sir J. W. Edgar, K. C. I. E., C. S. I., B. C. S.  
 Káliprasanna Ghosha.  
 Rev. J. M. Hamilton.  
 A. Macdonald, Esq.  
 J. W. Parry, Esq., C. E.  
 Lieut. E. W. Petley, R. N., F. R. C. S.  
 T. A. Pope, Esq.  
 Lieut.-Col. A. C. Toker, C. B.

### BY DEATH.

#### *Ordinary Members.*

E. F. T. Atkinson, Esq., C. I. E.  
 Kumár Isvariprasad Garga.  
 Alexander Grant, Esq., M. I. C. E.  
 S. A. Hill, Esq., B. Sc., A. R. S. M., F. C. S.  
 Nanda Kumár Roy.

#### *Honorary Member.*

Professor Bápu Deva Sástri.

### BY REMOVAL.

#### *Under Rule 40.*

Dr. J. E. T. Aitchison, C. I. E.  
 J. Barnett, Esq.  
 H. C. Barstow, Esq., C. S.  
 Sir C. E. Barnard, K. C. S. I., C. S.  
 T. F. Bignold, Esq.  
 Hon. Sir R. E. Egerton, K. C. S. I., C. I. E., C. S.  
 Sir Lepel H. Griffin, K. C. S. I., C. S.  
 Major W. G. Hughes, M. S. C.

[APPENDIX.]

ABSTRACT STATEMENT  
OF  
RECEIPTS AND DISBURSEMENTS  
OF THE  
ASIATIC SOCIETY OF BENGAL  
FOR  
THE YEAR 1890.



# STATEMENT

## *Asiatic Society*

### Dr.

#### To ESTABLISHMENT.

|            |    |     |     |     |              |          |          |
|------------|----|-----|-----|-----|--------------|----------|----------|
| Salaries   | .. | ... | ... | Rs. | 4,356        | 6        | 11       |
| Commission | .. | ... | ... | ... | 405          | 15       | 8        |
|            |    |     |     |     | <u>4,762</u> | <u>6</u> | <u>7</u> |

#### To CONTINGENCIES.

|               |     |     |     |     |              |           |          |
|---------------|-----|-----|-----|-----|--------------|-----------|----------|
| Stationery    | ... | ... | ... | ... | 86           | 14        | 0        |
| Lighting      | ... | ... | ... | ... | 48           | 0         | 0        |
| Building      | ... | ... | ... | ... | 193          | 5         | 9        |
| Taxes         | ... | ... | ... | ... | 819          | 0         | 0        |
| Postage       | ... | ... | ... | ... | 625          | 0         | 3        |
| Freight       | ... | ... | ... | ... | 10           | 0         | 0        |
| Meeting       | ... | ... | ... | ... | 91           | 12        | 0        |
| Miscellaneous | ... | ... | ... | ... | 192          | 10        | 3        |
|               |     |     |     |     | <u>2,066</u> | <u>10</u> | <u>3</u> |

#### To LIBRARY AND COLLECTIONS.

|                           |     |     |     |     |              |          |           |
|---------------------------|-----|-----|-----|-----|--------------|----------|-----------|
| Books                     | ... | ... | ... | ... | 1,889        | 3        | 5         |
| Local Periodicals         | ... | ... | ... | ... | 31           | 0        | 0         |
| Binding                   | ... | ... | ... | ... | 435          | 9        | 6         |
| Coins                     | ... | ... | ... | ... | 1            | 8        | 0         |
| Purchase of Copper plates | ... | ... | ... | ... | 35           | 0        | 0         |
| Catalogue of Tibetan MSS. | ... | ... | ... | ... | 66           | 4        | 0         |
|                           |     |     |     |     | <u>2,458</u> | <u>8</u> | <u>11</u> |

#### To PUBLICATIONS.

|                  |     |     |     |     |               |          |          |
|------------------|-----|-----|-----|-----|---------------|----------|----------|
| Journal, Part I  | ... | ... | ... | ... | 3,205         | 12       | 7        |
| Journal, Part II | ... | ... | ... | ... | 6,364         | 4        | 3        |
| Proceedings      | ..  | ... | ... | ... | 2,052         | 15       | 6        |
|                  |     |     |     |     | <u>11,623</u> | <u>0</u> | <u>4</u> |

To Printing charges of Circulars, Receipt-forms, &c. 222 10 0

To Personal Account (Writes off and Miscellaneous) ..... 21,133 4 1  
610 12 0

#### To EXTRAORDINARY EXPENDITURE.

|               |     |     |     |     |                   |              |                      |
|---------------|-----|-----|-----|-----|-------------------|--------------|----------------------|
| Auditor's fee | ... | ... | ... | ... | 100               | 0            | 0                    |
| Barisál Guns  | ... | ... | ... | ... | 6                 | 0            | 0                    |
|               |     |     |     |     | <u>To Balance</u> | <u>.....</u> | <u>106 0 0</u>       |
|               |     |     |     |     |                   |              | <u>137,611 14 10</u> |
|               |     |     |     |     | <u>Total Rs.</u>  | <u>...</u>   | <u>159,461 14 11</u> |

# NO. 1. of Bengal.

## Cr.

By Balance from last report ... .. Rs. 139,211 13 7

### BY CASH RECEIPTS.

|                                                                 |     |     |     |             |
|-----------------------------------------------------------------|-----|-----|-----|-------------|
| Publications sold for cash                                      | ... | ... | Rs  | 396 15 11   |
| Interest on Investments                                         | ... | ... | ... | 9,469 9 2   |
| Rent of two rooms on the ground floor of the Society's premises | ... | ... | ... | 300 0 0     |
| Advances recovered                                              | ... | ... | ... | 3 14 6      |
| Miscellaneous                                                   | ... | ... | ... | 57 5 9      |
|                                                                 |     |     |     | <hr/>       |
|                                                                 |     |     |     | 10,227 13 4 |

### BY PERSONAL ACCOUNT.

|                 |     |     |     |            |
|-----------------|-----|-----|-----|------------|
| Admission Fees  | ... | ... | ... | 736 0 0    |
| Subscriptions   | ... | ... | ... | 8,109 0 0  |
| Sales on credit | ... | ... | ... | 995 14 0   |
| Miscellaneous   | ... | ... | ... | 181 6 0    |
|                 |     |     |     | <hr/>      |
|                 |     |     |     | 10,022 4 0 |

Total Income ... .. 20,250 1 4

Total Rs. ... 159,461 14 11

WILL. KING,  
Honorary Secretary and Treasurer,  
Asiatic Society of Bengal.

Examined and found correct.

MEUGENS & KING,  
Public Accountants,  
The 20th March, 1891.

# STATEMENT

## *Oriental Publication Fund in Account*

**Dr.**

**To CASH EXPENDITURE.**

|                                |     |     |     |       |    |    |
|--------------------------------|-----|-----|-----|-------|----|----|
| Printing charges ...           | ... | ... | Rs. | 8,699 | 13 | 6  |
| Editing charges ...            | ... | ... | ... | 3,613 | 8  | 0  |
| Binding ...                    | ... | ... | ... | 7     | 0  | 0  |
| Salaries ...                   | ... | ... | ... | 1,766 | 0  | 0  |
| Advertising ...                | ... | ... | ... | 90    | 0  | 0  |
| Freight ...                    | ... | ... | ... | 15    | 0  | 0  |
| Stationery ...                 | ... | ... | ... | 54    | 1  | 0  |
| Copying ...                    | ... | ... | ... | 25    | 0  | 0  |
| Postage ...                    | ... | ... | ... | 819   | 13 | 6  |
| Purchase of MSS. ...           | ... | ... | ... | 22    | 0  | 0  |
| Contingencies ...              | ... | ... | ... | 65    | 11 | 1  |
| Commission on collecting bills | ... | ... | ... | 56    | 15 | 11 |

15,234 15 0

To PERSONAL ACCOUNT (Writes off and Miscellaneous) 5 4 0

|            |     |     |                          |       |               |          |          |
|------------|-----|-----|--------------------------|-------|---------------|----------|----------|
|            |     |     | <b>Total Expenditure</b> | ..... | 15,240        | 3        | 0        |
| To Balance | ... | ... | ...                      | ..... | 469           | 2        | 9        |
|            |     |     | <b>Total Rs.</b>         | ...   | <u>15,709</u> | <u>5</u> | <u>9</u> |

## NO. 2.

*with the Asiatic Society of Bengal.*

---

Cr.

|                          |     |     |     |       |     |       |   |   |
|--------------------------|-----|-----|-----|-------|-----|-------|---|---|
| Balance from last report | ... | ... | ... | ..... | Rs. | 3,695 | 7 | 6 |
|--------------------------|-----|-----|-----|-------|-----|-------|---|---|

## BY CASH RECEIPTS.

|                              |     |     |     |       |       |       |
|------------------------------|-----|-----|-----|-------|-------|-------|
| Government allowance         | ... | ... | Rs. | 9,000 | 0     | 0     |
| * Publications sold for cash | ... | ... | ... | 711   | 8     | 0     |
| Advances recovered           | ... | ... | ... | 85    | 15    | 0     |
|                              |     |     |     | <hr/> | <hr/> | <hr/> |
|                              |     |     |     | 9,797 | 7     | 0     |
|                              |     |     |     | <hr/> | <hr/> | <hr/> |

## BY PERSONAL ACCOUNT.

|                 |     |     |     |       |       |       |
|-----------------|-----|-----|-----|-------|-------|-------|
| Sales on credit | ... | ... | ... | 2,216 | 7     | 3     |
|                 |     |     |     | <hr/> | <hr/> | <hr/> |
|                 |     |     |     | 2,216 | 7     | 3     |
|                 |     |     |     | <hr/> | <hr/> | <hr/> |

|              |     |       |        |       |       |
|--------------|-----|-------|--------|-------|-------|
| Total Income | ... | ..... | 12,013 | 14    | 3     |
|              |     |       | <hr/>  | <hr/> | <hr/> |

|           |     |        |       |       |
|-----------|-----|--------|-------|-------|
| Total Rs. | ... | 15,709 | 5     | 9     |
|           |     | <hr/>  | <hr/> | <hr/> |

WILL. KING,  
*Honorary Secretary and Treasurer,*  
*Asiatic Society of Bengal.*

Examined and found correct.

MEUGENS &amp; KING,

*Public Accountants,**The 20th March, 1891.*

# STATEMENT

## *Sanskrit Manuscript Fund in Account*

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Dr.

To CASH EXPENDITURE.

|                     |     |       |     |       |    |   |            |
|---------------------|-----|-------|-----|-------|----|---|------------|
| Salaries            | ... | ...   | Rs. | 1,887 | 15 | 0 |            |
| Travelling expenses | ... | ...   | ... | 10    | 0  | 0 |            |
| Commission          | ... | ...   | ... | 0     | 10 | 0 |            |
| Printing charges    | ... | ...   | ... | 388   | 12 | 0 |            |
| Postage             | ... | ...   | ... | 28    | 8  | 9 |            |
| Contingencies       | ... | ...   | ... | 54    | 11 | 9 |            |
| Stationery          | ... | ...   | ... | 5     | 0  | 0 |            |
| Purchase of MSS.    | ... | ...   | ... | 500   | 4  | 6 |            |
| Freight             | ... | ...   | ... | 2     | 0  | 0 |            |
|                     |     |       |     | <hr/> |    |   | 2,377 14 0 |
| To Balance          | ... | ..... |     |       |    |   | 4,214 2 3  |

Total Rs. ... 6,592 0 3

NO. 3.

*with the Asiatic Society of Bengal.*

---

Cr.

Balance from last report   ...       ...       ...       .....   Rs.   3,300   0   3

BY CASH RECEIPTS.

|                      |     |     |     |              |          |          |
|----------------------|-----|-----|-----|--------------|----------|----------|
| Government allowance | ... | ... | Rs. | 3,200        | 0        | 0        |
|                      |     |     |     | <u>3,200</u> | <u>0</u> | <u>0</u> |

BY PERSONAL ACCOUNT.

|                 |     |     |     |           |          |          |
|-----------------|-----|-----|-----|-----------|----------|----------|
| Sales on credit | ... | ... | ... | 92        | 0        | 0        |
|                 |     |     |     | <u>92</u> | <u>0</u> | <u>0</u> |

|              |     |       |  |              |          |          |
|--------------|-----|-------|--|--------------|----------|----------|
| Total Income | ... | ..... |  | <u>3,292</u> | <u>0</u> | <u>0</u> |
|--------------|-----|-------|--|--------------|----------|----------|

|           |     |  |  |              |          |          |
|-----------|-----|--|--|--------------|----------|----------|
| Total Rs. | ... |  |  | <u>6,592</u> | <u>0</u> | <u>3</u> |
|-----------|-----|--|--|--------------|----------|----------|

WILL. KING,

*Honorary Secretary and Treasurer,*

*Asiatic Society of Bengal.*

Examined and found correct.

MEUGENS & KING,

*Public Accountants,*

*The 20th March, 1891.*

# STATEMENT

## *Personal*

### Dr.

To Balance from last report ... .. Rs. 4,687 4 8

#### To CASH EXPENDITURE.

|                                             |     |        |        |    |   |
|---------------------------------------------|-----|--------|--------|----|---|
| Advances for purchase of Sanskrit MSS., &c. | ... | .....  | 4,936  | 4  | 4 |
| To Asiatic Society                          | ... | 10,022 | 4      | 0  |   |
| To Oriental Publication Fund                | ... | 2,216  | 7      | 3  |   |
| To Sanskrit MSS. Fund                       | ... | 92     | 0      | 0  |   |
|                                             |     |        | 12,330 | 11 | 3 |

Total Rs. ... 21,954 4 3

NO. 4.

*Account.*

Cr.

|                              |     |     |     |        |    |   |
|------------------------------|-----|-----|-----|--------|----|---|
| By Cash receipts             | ... | ... | Rs. | 18,520 | 3  | 3 |
| By Asiatic Society           | ... | ... | ... | 610    | 12 | 0 |
| By Oriental Publication Fund | ... | ... | ... | 5      | 4  | 0 |
|                              |     |     |     | <hr/>  |    |   |
|                              |     |     |     | 19,136 | 3  | 3 |

| By Balances.      | Due to the Society. |       |       | Due by the Society. |       |       |
|-------------------|---------------------|-------|-------|---------------------|-------|-------|
|                   |                     |       |       |                     |       |       |
| Members ...       | 5,167               | 12    | 7     | 194                 | 12    | 10    |
| Subscribers ...   | 251                 | 1     | 0     | 73                  | 7     | 0     |
| Employés ...      | 30                  | 0     | 0     | 250                 | 0     | 0     |
| Agents ...        | 269                 | 2     | 6     | 2,269               | 15    | 10    |
| Miscellaneous ... | 253                 | 6     | 10    | 365                 | 2     | 3     |
|                   | <hr/>               | <hr/> | <hr/> | <hr/>               | <hr/> | <hr/> |
|                   | 5,971               | 6     | 11    | 3,153               | 5     | 11    |

2,818 1 0

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21,954 4 3

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WILL. KING,  
*Honorary Secretary and Treasurer,*  
*Asiatic Society of Benga .*

Examined and found correct.

MEUGENS & KING,  
*Public Accountants,*  
*The 20th March, 1891.*



# STATEMENT

## *Invest*

Dr.

|                                 |     |     | Nominal.    | Actual.      |
|---------------------------------|-----|-----|-------------|--------------|
| To Balance from last report ... | ... | Rs. | 141,300 0 0 | 141,015 1 7  |
| To Cash ...                     | ... | ... | .....       | 7 11 8       |
| Total Rs.                       | ... | ... | 141,300 0 0 | 141,022 13 3 |

| *Funds,         | Actual.    |         |     |            |       |       | Total.  |         |   |   |
|-----------------|------------|---------|-----|------------|-------|-------|---------|---------|---|---|
|                 | Permanent. |         |     | Temporary. |       |       |         |         |   |   |
| Asiatic Society | ...        | 135,400 | 0   | 0          | ..... | ..... | 135,400 | 0       | 0 |   |
| Sanskrit MSS.   | ...        | ...     | ... | ...        | 1,943 | 5     | 3       | 1,943   | 5 | 3 |
| Trust Fund      | ...        | 1,200   | 0   | 0          | ..... | ...   | 1,200   | 0       | 0 |   |
|                 |            | 136,600 | 0   | 0          | 1,943 | 5     | 3       | 138,543 | 5 | 3 |

# STATEMENT

## *Trust*

Dr.

|                                        |     |       |            |            |
|----------------------------------------|-----|-------|------------|------------|
| To Balance (Servants Pension Fund) ... | ... | ..... | Rs.        | 1,261 3 10 |
| Total Rs.                              | ... | ..... | 1,261 3 10 |            |

NO. 5.

*ments.*

Cr.

|             |     |     |     |     | Nominal. |         |   | Actual. |         |    |   |
|-------------|-----|-----|-----|-----|----------|---------|---|---------|---------|----|---|
| By Cash     | ... | ... | ... | Rs. | 2,400    | 0       | 0 | 2,479   | 8       | 0  |   |
| By Balance* | ... | ... | ... | ... | 138,900  | 0       | 0 | 138,543 | 5       | 3  |   |
| Total Rs.   |     |     |     |     | ...      | 141,300 | 0 | 0       | 141,022 | 13 | 3 |

WILL. KING,  
*Honorary Secretary and Treasurer,*  
*Asiatic Society of Bengal.*

Examined and found correct.

MEUGENS KING,  
*Public Accountants,*  
*The 20th March, 1891.*

NO. 6.

*Fund.*

Cr.

|                                 |     |     |       |           |       |       |    |    |
|---------------------------------|-----|-----|-------|-----------|-------|-------|----|----|
| By Balance from last report ... | ... | ... | ..... | Rs.       | 1,207 | 3     | 10 |    |
| By interest on Investments ...  | ... | ... | ..... |           | 54    | 0     | 0  |    |
|                                 |     |     |       | Total Rs. | ...   | 1,261 | 3  | 10 |

WILL. KING,  
*Honorary Secretary and Treasurer,*  
*Asiatic Society of Bengal.*

Examined and found correct.

MEUGENS & KING,  
*Public Accountants,*  
*The 20th March, 1891.*

# STATEMENT

## Cash.

| Dr.                          |     |     |                |
|------------------------------|-----|-----|----------------|
| To Balance from last report  | ... | ... | Rs. 1,712 2 11 |
| RECEIPTS.                    |     |     |                |
| To Asiatic Society           | ... | ... | 10,227 13 4    |
| To Oriental Publication Fund | ... | ... | 9,797 7 0      |
| To Sanskrit Manuscript Fund  | ... | ... | 3,200 0 0      |
| To Personal Account          | ... | ... | 18,520 3 3     |
| To Investment                | ... | ... | 2,479 8 0      |
| To Trust Fund                | ... | ... | 54 0 0         |
| Total Rs.                    |     |     | 45,991 2 6     |

# STATEMENT

## Balance

| Dr.                 |     |     |               |
|---------------------|-----|-----|---------------|
| To Cash             | ... | ... | Rs. 2,195 1 5 |
| To Investment       | ... | ... | 138,543 5 3   |
| To Personal Account | ... | ... | 2,818 1 0     |
| Total Rs.           |     |     | 143,556 7 8   |

## NO. 7.

### *Account.*

#### Cr.

##### EXPENDITURE.

|                                  |     |     |     |     |        |    |   |
|----------------------------------|-----|-----|-----|-----|--------|----|---|
| By Asiatic Society ...           | ... | ... | ... | Rs. | 21,239 | 4  | 1 |
| By Oriental Publication Fund ... | ... | ... | ... | ... | 15,234 | 15 | 0 |
| By Sanskrit Manuscript Fund ...  | ... | ... | ... | ... | 2,377  | 14 | 0 |
| By Personal Account ...          | ... | ... | ... | ... | 4,936  | 4  | 4 |
| By Investment ...                | ... | ... | ... | ... | 7      | 11 | 8 |
| By Balance ...                   | ... | ... | ... | ... | 2,195  | 1  | 5 |

Total Rs. ... 45,991 2 6

WILL. KING,  
Honorary Secretary and Treasurer,  
*Asiatic Society of Bengal.*

Examined and found correct.

MEUGENS & KING,  
Public Accountants,  
*The 20th March, 1891.*

## NO. 8.

### *Sheet.*

#### Cr.

|                                  |     |     |     |     |         |    |    |
|----------------------------------|-----|-----|-----|-----|---------|----|----|
| By Asiatic Society ...           | ... | ... | ... | Rs. | 137,611 | 14 | 10 |
| By Oriental Publication Fund ... | ... | ... | ... | ... | 469     | 2  | 9  |
| By Sanskrit Manuscript Fund ...  | ... | ... | ... | ... | 4,214   | 2  | 3  |
| By Trust Fund ...                | ... | ... | ... | ... | 1,261   | 3  | 10 |

Total Rs. ... 143,556 7 8

WILL. KING,  
Honorary Secretary and Treasurer,  
*Asiatic Society of Bengal.*

Examined and found correct.

MEUGENS & KING,  
Public Accountants,  
*The 20th March, 1891.*



PROCEEDINGS  
OF THE  
ASIATIC SOCIETY OF BENGAL,  
FOR MARCH, 1891.

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The Monthly General Meeting of the Asiatic Society of Bengal was held on Wednesday, the 4th March, 1891, at 9 P. M.

HON'BLE SIR A. W. CROFT, K. C. I. E., M. A., President, in the chair.

The following members were present :—

Dr. D. D. Cunningham, Bábu Sarat Chandra Dás, Rev. H. B. Hyde, Prince Jahán Qadr Muhammad Wáhid Ali Bahádur, Dr. G. King, Dr. W. King, C. Little, Esq., C. J. Lyall, Esq., J. D. Nimmo, Esq., W. L. Sclater, Esq., Dr. J. Scully, Pandit Hara Prasád Shástri, C. H. Tawney, Esq., Dr. J. H. Tull Walsh, Colonel J. Waterhouse.

The Minutes of the last meeting were read and confirmed.

Twenty-seven presentations were announced, details of which are given in the Library List appended.

The following gentlemen, duly proposed and seconded at the last meeting of the Society, were ballotted for and elected Ordinary Members :—

D. C. Baillie, Esq., C. S.

Dr. Aghore Chunder Chatterjee.

The following gentleman is a candidate for election at the next meeting :—

E. C. S. Baker, Esq., District Superintendent of Police, N. Cachar, proposed by W. L. Sclater, Esq., seconded by Dr. W. King.

The following gentlemen have expressed a wish to withdraw from the Society :—

Bábú Govinda Kumár Chaudhuri.

Jagánnath Khanah, Esq.

The PRESIDENT announced that the Council did not propose to take any further steps regarding the revision of the rules brought forward at the meeting in January last.

The SECRETARY read the names of the gentlemen who had been appointed by the Council to serve on the various Committees for the present year.

#### FINANCE AND VISITING COMMITTEE.

Bábú Pratápa Chandra Ghosha.

Rájá Rájendra Lála Mitra.

Dr. J. Scully.

Pandit Hara Prasád Shástri.

Colonel J. Waterhouse.

J. Wood-Mason, Esq.

#### LIBRARY COMMITTEE.

Nawáb Abdul Latif Bahádur.

Bábú Gaur Dás Bysack.

Dr. D. D. Cunningham.

Bábú Pratápa Chandra Ghosha.

Prince Jahán Qudr Muhammad

Wáhid Ali Bahádur.

J. Mann, Esq.

Rájá Rájendra Lála Mitra.

Bábú Asutosh Mukhopádhyáy.

Mahámahopádhyáy Pandit Moheśa-  
chandra Nyáyaratna.

L. de Nicéville, Esq.

Hon. Dr. Mahendra Lál Sarkár.

Dr. J. Scully.

Pandit Hara Prasád Shástri.

C. H. Tawney, Esq.

Colonel J. Waterhouse.

J. Wood-Mason, Esq.

#### PHILOLOGICAL COMMITTEE.

Nawáb Abdul Latif Bahádur.

J. Beames, Esq.

Bábú Gaur Dás Bysack.

Dr. A. Führer.

G. A. Grierson, Esq.

Bábú Pratápa Chandra Ghosha.

Maulvi Khudá Baksh Khán Bahá-  
dur.

C. J. Lyall, Esq.

J. Mann, Esq.

Rájá Rájendra Lála Mitra.

Bábú Bhudeva Mukerji.

Bábú Nilmani Mukerji.

Mahámahopádhyáy Pandit Moheśa  
chandra Nyáyaratna.

Captain D. C. Phillott.

Bábú Rajkumár Sarvádrikari.

Sir Sayid Ahmad.

Hon. Dr. Mahendra Lál Sarkár.

Pandit Hara Prasád Shástri.

C. H. Tawney, Esq.

Captain R. C. Temple.

Dr. G. Thibaut.

## COINS COMMITTEE.

|                           |                   |
|---------------------------|-------------------|
| Dr. A. Führer.            | Dr. J. Scully.    |
| Rájá Rájendra Lála Mitra. | V. A. Smith, Esq. |
| J. H. Rivett-Carnac, Esq. |                   |

## HISTORY AND ARCHÆOLOGICAL COMMITTEE.

|                              |                           |
|------------------------------|---------------------------|
| Hon. Justice Amir Ali.       | Mahámahopádhya Kavirája   |
| J. Beames, Esq.              | Shyamaldás.               |
| Bábú Gaur Dás Bysack.        | Rájá Rájendra Lála Mitra. |
| W. H. P. Driver, Esq.        | J. H. Rivett-Carnac, Esq. |
| Dr. A. Führer.               | Captain R. C. Temple.     |
| Bábú Pratápa Chandra Ghosha. | J. Wood-Mason, Esq.       |

## NATURAL HISTORY COMMITTEE.

|                        |                       |
|------------------------|-----------------------|
| Dr. A. W. Alcock.      | L. de Nicéville, Esq. |
| Dr. A. Barclay.        | Dr. Fritz Noetling.   |
| E. C. Cotes, Esq.      | R. D. Oldham, Esq.    |
| Dr. D. D. Cunningham.  | S. E. Peal, Esq.      |
| J. F. Duthie, Esq.     | Dr. J. Scully.        |
| Dr. G. M. Giles.       | Dr. J. H. Tull Walsh. |
| Dr. G. King.           | J. Wood-Mason, Esq.   |
| C. S. Middlemiss, Esq. |                       |

## PHYSICAL SCIENCE COMMITTEE.

|                          |                               |
|--------------------------|-------------------------------|
| Dr. J. R. Adie.          | Bábú Asutosh Mukhopádhyaý.    |
| Dr. A. W. Alcock.        | Dr. Fritz Noetling.           |
| P. N. Bose, Esq.         | R. D. Oldham, Esq.            |
| Bábú Gaur Dás Bysack.    | A. Pedler, Esq.               |
| Dr. D. D. Cunningham.    | Dr. D. Prain.                 |
| J. Eliot, Esq.           | Hon. Dr. Mahendra Lál Sarkár. |
| S. R. Elson, Esq.        | Dr. J. Scully.                |
| Dr. G. M. Giles.         | Dr. W. J. Simpson.            |
| Dr. G. King.             | Col. H. Thuillier.            |
| Rev. Father E. Lafont.   | Colonel J. Waterhouse.        |
| J. J. D. La Touche, Esq. | J. Wood-Mason, Esq.           |
| C. S. Middlemiss, Esq.   |                               |

The PHILOLOGICAL SECRETARY exhibited a photograph of the inscription on the Monument which commemorates the Patna Massacres in October 1763, forwarded by Mr. Beveridge.

Rev. H. B. Hyde stated that he remembered to have noticed in the General Letters from the Court of Directors (series now at the Home



office here), that this Patna monument was erected by the Council and that the Court censured this expenditure of their money.

The Proposal of the Council to extend the permission given of investing half a lakh of rupees of the Society's *Permanent Reserve Fund* in Municipal or Port Trust Debentures, so as to include the alternative of fixed deposits in Calcutta Banks, was brought forward for consideration.

Mr. Tawney opposed the proposal as, in his opinion, it practically amounted to lending the money of the Society without security.

The Proposal was agreed to.

Dr. J. H. Tull Walsh gave notice of the following proposal, which he intends to bring forward at the next meeting of the Society.

"That with a view to making the meetings of the Society more interesting to individual members, two sections be formed, A.—Literature and Archæology, etc., B.—Natural Sciences. That these sections have separate evenings for the holding of meetings and for the reading of papers on subjects interesting to the members of the respective sections."

Bábú Sarat Chandra Dás exhibited some old and modern coins of Tibet and read a note on them.

The notes and the coins will be published in the Journal, Part I.

The following papers were read:—

1. *A list of the Butterflies of Engerno, with some remarks on the Demeridae.*—By WILLIAM DOHERTY, Cincinnati, U. S. A. Communicated by the NATURAL HISTORY SECRETARY.

2. *The Butterflies of Sumba.*—By WILLIAM DOHERTY, Cincinnati, U. S. A. Communicated by the NATURAL HISTORY SECRETARY.

3. *On certain Spiders which mimic Ants.*—By DR. J. H. TULL WALSH.

4. *Catalogue of Oriental Diptera.*—By MONS. J. BIGOT. Communicated by the NATURAL HISTORY SECRETARY.

The papers will be published in the Journal, Part II.



## LIBRARY.

The following additions have been made to the Library since the meeting held in February last.

## TRANSACTIONS, PROCEEDINGS AND JOURNALS,

*presented by the respective Societies and Editors.*

Berlin. Der Gesellschaft Naturforschender Freunde zu Berlin, 1890.

Bombay. The Indian Antiquary,—Vol. XX, Parts 243—44.

Budapest. La Société Hongroise de Géographie,—Bulletin, Tome XVIII, Nos. 7—9.

Calcutta. Indian Engineering,—Vol. IX, Nos. 6—9, and Index to Vol. VIII.

———. Photographic Society of India,—Journal, Vol. IV, No. 2.

Genoa. Museo Civico di Storia Naturale di Genova,—Annali, serie 2<sup>a</sup>, Vols. VII—IX.

The Hague. Koninklijk Instituut voor de Taal-, Land-en Volkenkunde van Nederlandsch-Indië,—Bijdragen tot de Taal- Land-en Volkenkunde van Nederlandsch-Indië, Deel VI, Aflevering 1.

Ithaca. Cornell University,—Library Bulletin, Vol. II, No. 14.

Jassy. Societății Științifice Și Literare din Iasi,—Arhiva, Anno II, No. 5.

Liège. Société Géologique de Belgique,—Annales, Tome XVI, Nos. 2 et 4.

London. Institution of Electrical Engineers,—Journal, Vol. XIX, No. 90.

———. Nature,—Vol. XLIII, Nos. 1108—10.

———. The Academy, Nos. 977—79.

———. The Athenæum, Nos. 3300—2.

Mendon, Illinois. The American Antiquarian and Oriental Journal,—Vol. XIII, No. 1,

Newport, R. I. Newport Natural History Society,—Proceedings, 1889—90.

Paris. La Société de Géographie,—Compte Rendu des Seances, No. 1, 1891.

Philadelphia. Journal of Comparative Medicine and Veterinary Archives,—Vol. XII, No. 1.

Rio de Janeiro. Observatorio do Rio de Janeiro,—Revista do Observatorio, Anno V, No. 13.

- Rome. La Società Degli Spettroscopisti Italiani,—*Memorie*, Vol. XIX, Disp. 12<sup>a</sup> et Index Tome XIX.
- Roorkee. The Indian Forester,—Vol. XVI, Nos. 9—12.
- Sydney. Linnean Society of New South Wales,—*Proceedings*, Vol. V, Part, 3.
- . Royal Society of New South Wales,—*Journal and Proceedings*, Vol. XXIV, Part 1.
- Stockholm. Société Entomologique de Stockholm,—*Journal Entomologique*, No. 5, 1889; Nos. 1—4, 1890.
- Zagreb. Hrvatskoga Arkeologickoga Druztva,—*Viestnik*, Godina XIII, Br. 1.

### BOOKS AND PAMPHLETS,

*presented by the Authors, Translators, &c.*

- BLOOMFIELD, MAURICE. Contributions to the Interpretation of the Veda, 2nd series (Reprinted from the *Journal of Philology*, Vol. XI, No. 3). 8vo. Baltimore, 1890.
- CULIN, STEWART. The Y Hing or "Patriotic Rising." A Secret Society among the Chinese in America. 8vo. 1890.
- RĀV, PRATĀPA CHANDRA, C. I. E. The Mahabharata, translated into English Prose, Part 64. 8vo. Calcutta, 1891.

### MISCELLANEOUS PRESENTATIONS.

- Abstract Account of the treatment and out-turn of the experimental portion of the Government Farm, Nagpur, from 1884-85 to 1889-90. Fcp.

CHIEF COMMISSIONER, CENTRAL PROVINCES.

- Magnetical and Meteorological Observations made at the Government Observatory, Bombay, in 1888 and 1889. 4to. Bombay, 1890.

COLABA OBSERVATORY.

- Report of the Director of the Colombo Museum for 1889. Fcp. Colombo, 1890.

COLOMBO MUSEUM.

- Selections from the Records of the Government of India, Home Department, No. CCLXXV.—Reports on Publications issued and registered in the several provinces of British India during the year 1889. Fcp. Calcutta, 1890.

GOVERNMENT OF BENGAL.

- The Fauna of British India, including Ceylon and Burma. Reptilia and Batrachia. By George A. Boulenger. 8vo. London, 1890.

The Indian Antiquary, Vol. XX, Part 243, January 1891. 4to. Bombay, 1891.

Memorandum by the Under-Secretary of State for India, relating to the Accounts of the Government of India for 1888-89, and the Estimate for 1889-90 and 1890-91. Fcp. London, 1890.

Report from the Select Committee on East India (Civil Servants); with the Proceedings of the Committee. Fcp. London, 1891.

Statement exhibiting the Moral and Material Progress and Condition of India during the year 1888-89. No. 13. Fcp. London, 1890.

Usha, Part 7. 8vo. Calcutta, 1891.

GOVERNMENT OF INDIA, HOME DEPARTMENT.

Scientific Results of the Second Yarkand Mission; based upon the collections and notes of the late Ferdinand Stoliczka, Ph. D. Coleoptera. 4to. Calcutta 1890.

GOVERNMENT OF INDIA, REV. AND AGRI. DEPARTMENT.

Report on the Administration of the N.-W. Provinces and Oudh, for the year ending 31st March 1890. Fcp. Allahabad, 1891.

GOVERNMENT OF N.-W. P. AND OUDH.

Map to accompany the Settlement Report of the Ludhiana District. Sheets.

GOVERNMENT OF THE PUNJAB.

The Laying of the Foundation stone of the Vizianagram Laboratory of the Indian Association for the Cultivation of Science, March, 27th 1890. 8vo. Calcutta, 1890.

Report of the Thirteenth Annual Meeting of the Indian Association for the Cultivation of Science held March 1890. 8vo. Calcutta, 1890.

INDIAN ASSOCIATION FOR THE CULTIVATION OF SCIENCE.

De Badoej's door Dr. Jul Jacobs en J. J. Meijer. 8vo. Hague, 1891.

KÖNINKLIJK INSTITUUT VOOR DE TAAL,-LAND EN VOLKENKUNDE  
VAN NEDERLANDSCH-INDIE, HAGUE.

Inquiry concerning the site of ancient Palibothra. By William Francklin. 4to. London, 1815.

Javaansche Spraakkunst. A volume of plates. 4to. London.

Researches in Assyria, Babylonia, and Chaldæa. By William Ainsworth, F. G. S., F. R. G. S. 8vo. London 1858.

Sanskrit Mahabharat, Parts I—IV (in 2 vols.). 4to. Burdwan, 1862.

BĀBŪ ASUTOSH MUKHAPĀDHYĀY.

Return of Wrecks and Casualties in Indian Waters for the year 1889. Fcp. Calcutta, 1891.

PORT OFFICER, CALCUTTA.

Bulletin of Miscellaneous Information, 1890. 8vo. London, 1890.

ROYAL GARDENS, KEW.

Results of the Magnetical and Meteorological Observations made at the Royal Observatory, Greenwich, in the year 1888. 4to. London, 1890.

ROYAL OBSERVATORY, GREENWICH.

### PERIODICALS PURCHASED.

Calcutta. Indian Medical Gazette,—Vol. XXVI, No. 2.

Geneva. Archives des Sciences Physiques et Naturelles,—Tome XXV, No. 1.

Leipzig. Annalen der Physik und Chemie,—Band XLII, Heft 2.

———. ———. Beiblätter, Band XV, Stück 1.

London. The Chemical News,—Vol. LXIII, Nos. 1626—28.

Paris. Revue Scientifique,—Tome XLVII, Nos. 4—6.

### BOOKS PURCHASED.

JACQUEMONT, VICTOR. Letters from India; describing a journey in the British Dominions of India, Tibet, Lahore, and Cashmere, during the years 1828—31. 8vo. London, 1834.

RENNELL, JAMES, F. R. S. Memoir of a map of Hindoostan of the Mogal Empire. Edition 1788. 4to. London, 1788.

WILCOCKE, SAMUEL HULL. Voyages to the East-Indies; by the late John Splinter Stavorinus. Translated from the original Dutch. Vols. I—III. 8vo. London, 1798.



**PROCEEDINGS**  
**OF THE**  
**ASIATIC SOCIETY OF BENGAL,**  
**FOR APRIL, 1891.**

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The Monthly General Meeting of the Asiatic Society of Bengal was held on Wednesday, the 1st April, 1891, at 9-15 P. M.

A. PEDLER, Esq., F. C. S., Vice-President, in the chair.

The following members were present :—

Bábú Sarat Chandra Dás, P. Donaldson, Esq., Bábú Rajani Kánta Gupta, Dr. A. F. R. Hoernle, Rev. H. B. Hyde, W. H. Jobbins, Esq., Rev. Father E. Lafont, C. Little, Esq., Kumár Rameswár Maliáh, Bábú Asutosh Mukhopádhyaý, T. R. Munro, Esq., L. de Nicéville, Esq., J. D. Nimmo, Esq., W. L. Sclater, Esq., Pandit Hara Prasád Shástri, C. H. Tawney, Esq., Colonel J. Waterhouse.

Visitors :—Dr. K. S. Macdonald, Dr. W. W. Sheppard.

The minutes of the last meeting were read and confirmed.

Eighteen presentations were announced, details of which are given in the Library List appended.

The following gentleman, duly proposed and seconded at the last meeting of the Society was ballotted for and elected an Ordinary Member :—

E. C. S. Baker, Esq.

The following gentleman is a candidate for election at the next meeting :—

C. R. Wilson, Esq., Professor, Presidency College, proposed by A. Pedler, Esq., seconded by C. Little, Esq.

The SECRETARY reported the death of Dr. Otakara Feistmantla, a foreign member of the Society.

The PRESIDENT read a circular from the Royal Society of New South Wales, enumerating prizes to be given for original researches on certain subjects connected with Australia.

Dr. A. F. Rudolf Hoernle again exhibited the old birch bark MS., brought by Lieut. Bower from Kashgaria, and made the following remarks concerning it:

"This MS. was first shown to the Society in November last, in the Proceedings of which month an account of its acquisition by Lieut. Bower is printed. That account appears to have been reprinted in the *Bombay Gazette*, a copy of which accidentally fell into my hands in Aden on my way out to India in March last. It was the first notice I had of it; Major Cumberland, whose companion Lieut. Bower had been on his travels, was a fellow-passenger of mine and gave me corroborative information; all this made me very anxious to see the MS. On my reaching Calcutta I was very glad to find that the MS. was still in the possession of Colonel Waterhouse, who very kindly at once made it over to me for examination.

"The MS. has been with me only a little more than a week, and my examination of it, of course, is not yet finished; but I have already been able to determine several important points; and as hitherto it has been impossible to ascertain anything about the character and contents of the manuscript, I will not delay communicating my information, though further examination may possibly induce me to modify it on some minor points.

"The first point that strikes one on looking through the MS. is, that it appears to be written in three, if not four, different styles. This point has been already noticed in the November account. But what is more,—the difference is not (as may seem at first sight) merely one of careful and slovenly writing, but one of variety of alphabet. The whole manuscript is written in what Mr. Fleet (in his *Gupta Inscriptions* in Volume III of the *Corpus Inscriptionum Indicarum*, p. 3) distinguishes as the Northern class of the Nāgarī alphabet, which is characterised by the peculiar form of the *m*. Of this class, however, three varieties are observable in the MS. The test-letter of these varieties is the palatal ś, which is formed in three different ways. The first of them, with a rounded top, is that commonly used in the Northern Gupta inscriptions; the other two closely approach the form

of the palatal  $\acute{s}$  in the Śāradā alphabet of Kashmīr. The first variety of writing is shown in the upper portion of Plate VI published in the November Proceedings; and the third variety in the lower portion. Of the second variety—one of great neatness—a specimen is now figured in the lower part of Plate I, which accompanies this account. The upper part of this plate gives another specimen of the first variety. The three varieties have no reference to difference of age, but merely indicate difference of locality. The second and third varieties, as shown by their approach to the Śāradā characters, were probably current in the extreme North-West of the great area of the Northern class of alphabets, while the first variety was used in the remainder of that area.

“On examining more closely the several leaves, I noticed that they were evidently mixed up. The leaves written in the different hands followed one another without any order. But I also noticed that many of the leaves were marked with numbers on their left hand margin. Accordingly I cut the string which passed through them and held them together, and arranged them in their proper order, as indicated by their numbers. It then was seen, that 33 leaves, forming the main portion of the MS., followed in consecutive order, and that these 33 leaves were written throughout in the first variety of the alphabet. This variety extended to the obverse of the 33rd leaf; but on the reverse of that leaf commenced the second variety, and went on over five leaves. The remainder of the leaves were written in the third variety.

“It further seemed that the three varieties of writing distinguished three different works, the reasons of which I shall explain presently.

“I now took up the main portion (of 33 leaves), and deciphering the first page of the first leaf, discovered that it contained an introduction, giving the name of the work and detailing its contents. The work is a compendium of medicine, is named the *Nāvanītaka*, and consists of sixteen chapters (*adhyāya*). That it was written\* by a Buddhist, is seen from the initiatory salutation of the “Tathāgatas” or Buddhas. But I have not yet succeeded in tracing anywhere the name of its author.

“The following is a transcript and translation of the introduction. It is written in Sanskrit verse (*śloka*). In fact the contents of the whole MS. appear to be composed in ślokas.”

\* The form of salutation varies according to the creed of the writer of a MS. The present salutation is, therefore, not strictly evidence as to the creed of the author of the work, but only as to that of the scribe of the MS.



(line 1) नमस्तथागतेश्वरः ।

प्राक्प्रणीतैर्मन्त्रैर्वा योगसुखैस्समन्वितम् [1]

वक्ष्ये च सिद्धसंकरणं नाम्ना वै नावनीतकम् ॥ [१॥]

(line 2) नाना व्याधिपरीतानां तृणां (\*स्त्रीणां) च यद्वितम् [1]

कुमाराणां हितं यच्च तत्सुखमिह वक्ष्यते ॥

समासरत्तुदीनां भिषजां त्रीतिवर्द्धनम् [1]

योगवाङ्मयतथापि विस्तरं मनोनुगम् ॥ [१॥]

अथायं चूर्णयोगानां प्रथमं चाच (line 3) वक्ष्यते [1]

द्वितीयं घृतपाणानां तृतीयं तैलसन्निभम् ॥ [१॥]

चतुर्थं मिषकं नाम नानाव्याधिकिस्त्रितम् [1]

पञ्चमं वल्लियोगानां रसायनविधानतः ॥ [१॥] †

(line 4) सप्तमं च यवागूनां दध्यमद्यमसुच्यते [1]

नेत्रांजनानां नवमं दशमं केसररञ्जनम् ॥ [१॥]

अभयकल्पनामास्त्रमनैकादशसुच्यते [1]

द्वादशं स्नाञ्जेलजतोषिव (line 5) कस्य पयोदशम् ॥ [१॥]

कुमारभृत्यमय्यच्च स्नाचानु[र्दश]मिष्यते [1]

वन्ध्याचिकित्सिताणां च ज्ञेयं पञ्चदशं बुधैः ॥ [१॥]

सुभगाचिकित्सिताणां च तथा षोडशकं मतम् [1]

इत्येते षोड (line 6) श्राद्धाया विज्ञेया नावनीतकम् ॥ [१॥]

नेदं दद्यादपुत्राय न चाभावे कथञ्चन [1]

अग्निष्ये प्रसूतो न स्नात्कर्तव्य इति मे मतिः ॥ [१॥]

\* Conjectural ; the leaf is here defective showing only portions of letters.

† There is here a difficulty about the sixth chapter. As the *rasāyana* are a distinct subject from the *vasti*, it seems clear that the word *rasāyana-vidhānataḥ* refers to the sixth chapter. The text may be corrupt, and should probably be read *rasāyana-vidhā tataḥ* i. e., 'next the rules about elixirs,' or perhaps *rasāyana-vidhā = tataḥ*, the word *tataḥ* indicating the sixth chapter.

‡ The two *aksharas* ~~दे~~ are omitted in the MS.

## Translation.\*

'Salutation to the Tathāgatas.—I am going to write an approved compendium (of medicine), called the Nāvanītaka, based on the excellent system of the Maharshis as composed by them in olden times. Whatever is useful to men and women afflicted with various diseases; whatever is also useful for children, that will all be declared in this book. It will commend itself to those physicians whose minds delight in conciseness; but on account of the multiplicity of its prescriptions, it will also be welcome to those whose minds love many details.

'The first chapter will give prescriptions of powders; the second of clarified butter; the third will be concerned with oils. The fourth will be about the mixtures which are used in the treatment of various diseases. The fifth will give prescriptions of clysters, the sixth rules about elixirs. The seventh will be about gruels, the eighth about aphrodisiacs, the ninth about eyewashes, the tenth about hair-dyes. The eleventh will be concerned with applications of the yellow myrobalan.† The twelfth will be about bitumen, the thirteenth about castor-oil. The fourteenth will be concerned with the treatment of children; the fifteenth will deal with the treatment of barren women. Lastly the sixteenth will be about the treatment of women who have children. These sixteen chapters will constitute the Nāvanītaka. It should not be given to any one who has no son, nor to any one who has no brother; nor should it be taught to any one who has no disciple.'

"After this commences the first chapter on the *chūrṇas* or powders; it extends down to the obverse of the fourth leaf, where its end is indicated by the words *नान्वीतके चूर्णेयोगस्तुमाप्ताः । प्रथमोऽध्यायस्तुमाप्तः ।* i. e., 'in the Nāvanītaka the prescriptions of powders are finished; the first chapter is finished.' The following are some of the names of the powders that I have noticed: *varddhamānaku*, *śhaḍyūdika*, *tiktaka*, *vrisha-dvādaśaka*, *arishṭa*, etc.

"The second chapter on clarified butter extends to the obverse of the ninth leaf, where we find the remark *द्वितीयोऽध्यायः । वज्रातेन प्रवक्ष्यामि वानरोमविबन्धेनम् ।* i. e., '(here ends) the second chapter; I shall (now) explain the Valā oil, the cure for rheumatism.' The following are some of the names of clarified butter; after each name the number of ślokas about it are given: thus *amṛita-prāsa* with 10 ślokas, *kalyāṇaka* with 4, *tiktaka* with 4, *mahātiktaka* with 7, *mṛidvika* with 3, *māyūra* with 7, etc.

\* The translation is tentative. Some of the medical terms are not known to me, nor to those Kavirājs whom I consulted.

† *Abhayā*, I am told by a Kavirāj, is a synonym of *haritakā*. See also Glossary to the Bibliotheca Indica edition of the *Āśva Vaidyaka*.

“The third chapter on oils extends to the obverse of the thirteenth leaf, where it ends thus: नावनौतके सिद्धसङ्कर्षे तैलपञ्चसुतीयो ऽध्यायः । अतः परं प्रकीर्णकयोगान्वष्ट्यामः, *i. e.*, ‘(here ends) the third chapter on oils in the approved compendium Nāvanītaka; in the following we shall declare miscellaneous proscriptions.’ The following are some of the kinds of oil spoken of: *valā* oil in 16 ślokas, *amṛita* oil in 25 ślokas, *āsvagandhā* oil, etc.

“The fourth chapter on mixtures or miscellaneous prescriptions ends on the obverse of the seventeenth leaf, with the words: इति नावनौतके मिश्रको ऽध्यायस्तुत्यः । अतः परं प्रवक्ष्यामि वल्लवर्षप्रसादकम् येन हंसा निवर्द्धन्ते वलं चैवोपजायन्ते । *i. e.*, ‘here (ends) the fourth chapter in the Nāvanītaka, (called) Miśraka; in the sequel I am going to declare means of improving vigour and colour, by which good spirits are increased and vigour also is generated.’ Of this chapter I may give the following verses as a specimen:—

भृष्टान्भृष्टान्मिलान्सम्यक्चोरे निर्व्याथ पीषयेत् ।

वातरक्तप्रदेहलैल्लैर्वा मधुकायितैः ॥ [१ ॥]

श्लक्ष्णः प्रलेपः सृष्टतैश्चगलीचौरगोधुमैः ।

वातरक्तहरं ज्ञेयं प्रधानमिदमौषधम् ॥ [२ ॥]

वातश्रोणितप्रशमनं योगद्वयं स्त्री २ ॥

सर्पिलैलं गुडं शृङ्गं पञ्चमं विश्वमेवजं ।

पीतमेतद्भवेत्स्यस्वर्षणं विकश्ललनुत् ॥

चिचकं पिप्पलीसूलं वचा कटुकरोहिणी ।

पाठा वल्लकवीजश्च हरौतको महीषधम् ॥

*i. e.* (1) ‘Let thoroughly parched sesamum seed, well sprinkled into thickened milk, be pressed to consistency: or with the same sesamum seed mixed with liquorice a plaster may be made for rheumatism.

(2) Thickened goat’s milk and (flour of) wheat with clarified butter makes an excellent ointment. This may be considered the principal remedy against rheumatism (or gout).

The above are two prescriptions for the curing of rheumatism.

(1) Clarified butter, oil, treacle, vinegar, and, as the fifth, ginger; these, when drunk, are an instant remedy against pains in the lower part of the spine (*i. e.*, against lumbago).

(2) Castor-oil, the root of long pepper, the *vachā*-root, the *Helleborus niger*, the *Stephania Hernandifolia*, and the seed of *Holarrhena Antidysenterica* and *chebulic myrobalan* are a grand remedy.’

“ From the fourth chapter onwards I have not yet been able fully to trace the remaining chapters. On the 24th and 25th leaves I have noticed several names of gruels or *yavágú*, which belong to the seventh chapter.

“ On the obverse of the 28th leaf I have noticed the ending of the 8th chapter, thus नावनौतके सिद्धसंकर्षे नानाचार्यमते दृष्योऽऽः समाप्ताः । i. e., ‘here end the prescriptions of Aphrodisiacs (as set forth) in the approved compendium Nāvanítaka according to the doctrine of various Āchāryas.’

“ On a subsequent leaf I have noticed portions of the eleventh chapter; and on another the beginnings of the twelfth and thirteenth chapters: thus अथातः शिलाजतुकल्पं व्याख्यास्यामः and अथातश्चिकित्सककल्पं व्याख्यासः । i. e. ‘here we shall explain the application of bitumen’ and ‘here we explain the application of castor-oil.’

“ So far as I can judge for the present, the MS. does not seem to be complete; though I cannot say whether much or little of it is lost.

“ As I explained before, this medical work ends on the obverse of a certain leaf; and on the reverse of that leaf commences what appears to be a different work written in the second variety of the alphabet. At the bottom of the obverse of this leaf, marking apparently the end of the medical work, there is a line of writing, in the third variety of the alphabet. It runs thus इत्यत्र चेत्येतस्याधिपत्ये शतस्याधिकरणे स्वाहा । This would seem to have been added to the MS. by the scribe who wrote the third portion of the MS. I do not understand its meaning.

“ The beginning of the second portion of the MS., which commences on the reverse of the leaf just referred to, runs thus :—

नमो नन्दिरद्रेक्षराय—नमो आचार्येभ्यः—नमो ईश्वराय—नमो माणिभद्राय(?)—नमस्सर्व-  
यक्ष...\*—नमस्सर्वदेवेभ्यः शिवाय नमः षष्ठीये नमः प्रजापतये नमः रुद्राय नमः नमो  
वैश्रवणाय नमो मरुतानां नमः etc.

“ The following is a specimen of the contents of this part of the manuscript. See Plate I, No. II, end of first line.

परिचिद्यते ते बुद्धिः.....†

(line 2) आरम्भश्चिन्तितो यत्ने निष्फलः स भविष्यति ॥ श्रापटः ४४३

व्याधिभिर्भोज्यसे क्षिप्रं सुखं वा प्राप्स्यसे तथा ।

नात्युचं नातिनीचं च फलमासांदिष्यसि—॥ द्वितीयश्रापटः ॥ (line 3) [४३४]

\* The dots signify illegible *aksharas*.

† The other half of the śloka is broken away and lost.

आयसो ह्यस्ते घोरो येभ्यश्च तव विप्रश्चः ।

निष्फलं ह्यस्ते कार्यं ह्यस्यै यस्य कारणा—॥ इतीयमापठः ॥ ३४४

“ This may be thus translated :

‘ 1, Thy intelligence is spoiled, ..... Whatever undertaking thou thinkest of, that will be fruitless.

‘ 2, From diseases thou shalt quickly be delivered ; and happiness thou shalt obtain ; and a result thou shalt enjoy, neither very great nor very small.

‘ 3, Fearful is sure to be the exertion with those, with whom thou hast a quarrel ; fruitless is sure to be the business of which thou askest the causes.’

“ The whole consists of similar proverbial sayings divided in sets. Thus besides the above three *śāpaṣa*, there are three *māli*, five *bahula*, three *kūṣa*, four *bhadrā*, six *śakti*, six *dundubhi*, three *vriṣa*, three *preśhyā*, three *viṣi*, three *karnṇa*, three *sajā*, three *kāna*, three *chunchuṇa*, three *pañji* or *pāñji*, etc. What these terms may mean I do not know.

“ The system of enumeration, however, is curious and noteworthy. The three *śāpaṣa* are indicated by varying the relative position of three numbers: 443, 434, 344. Similarly the six *śakti* are enumerated by the variations of 341 = first, 134 = second, 413 = third, 314 = fourth, 143 = fifth, 431 = sixth.

“ I may here note that the numbers are indicated, through all the three portions of the MS., not by means of numeral figures, but numeral letters. Nor is the modern decimal system of notation used, but the older one which indicated the tens, hundreds, etc. by separate signs ; thus 16 is expressed by the symbols for 10 and 6, 25 by those for 20 and 5, etc.

“ Regarding the third portion of the MS., I can say, for the present but little. It is written in a third variety of the alphabet. It appears to contain charms or prayers, and to be of small interest. But I have not yet been able to examine it more closely. A specimen of it is given in the lower portion of the plate which accompanies the account in the November Proceedings. That specimen reads thus :

line 1, दुन्दुभी - गर्जनी - वर्षयी - स्फोटनी - पतनी - पाचनी - चारिणी - कंपनी - मदनी(?) . . . . . \*

line 2, मे - गोलायाः परिवेष्टाय वर्षतु देवो समन्तेन - इति किसि स्या (read स्या ?) । मैत्री मे भित्तराङ्गेषु (read इत ?) मैत्री नैरा-

\* The dots signify illegible aksharas.

line 3, वरुणेषु च - विरुपाक्षेषु मे मैत्री दध्यगीतमक्रेषु च - मणिना नागराज्ञा मे मैत्री वासुकीना-

line 4, मणि - दण्डपादेषु देवेषु\* पूर्वभक्षेषु च सदा - मन्दोपमन्दो वे नागा वर्षवन्ती यशस्विनः देवा-

line 5, सुरं पि संप्राममनुभवंति महर्षिका - अनवतप्तेन वरुणेन मैत्री संहारकेन च - तच्चकेन अनन्तेन












line 6, तथा वासुसुखेन च - अपराजितेन मे मैत्री मैत्री च्छिन्त्यसुतेन च - महात्मनः खिना नित्यं तथैवं च

i. e., 'may God rain all over my territory; hail to Ilikisi; my loving trust is in Dhṛitarāshṭra; my loving trust is in Nairāvaṇa (Airāvaṇa ?); in Virūpāksha is my loving trust and in Kṛishṇa Gautama; in Maṇi, the king of Nāgas is my loving trust, also in Vāsuki; in Daṇḍapāda, in ? and in Pūrṇabhadra at all times; in Nanda and Upauṇḍa, the beautiful and glorious, who most successfully maintain a contest even with the Gods and Asuras; in Anavatapta, in Varuṇa is my loving trust, and in Saṃhāraka; in Tākshaka, Ananta, and further in Vāsumukha; in Aparājita is my loving trust; and my loving trust is in Chhibbasuta (?); and likewise in Mahāmanasvin perpetually.'

"The language of the manuscript is Sanskrit; not, however, the ordinary standard Sanskrit, but that species of ungrammatical Sanskrit, which formerly used to be known by the name of the Gāthā dialect, and which was the language used for literary purposes by the Northern or North-Western Buddhists, outside the schools of Brahmanic learning, in the centuries immediately before and after the commencement of the Christian era. It was a species of Sanskrit which in inflexion, syntax and metrics was not bound by the ordinary rules and usages of Sanskrit Grammar. The awkwardness of the Sanskrit in the introductory verses is noticeable. The word *adhyāya* is used as being of the neuter gender, while in the standard Sanskrit it is masculine. In the second extract we have *pśhayet* for the regular Sanskrit *peshayet*, and, in the colophon quoted above it, the wrong concord *valaṇ upajayante* (singular subject with plural predicate). In the third extract, *parihiyate* stands for *parihīyate* and *kāraṇā* is used as the accusative plural, instead of *kāraṇāni*. In the fourth extract, we have the irregular sandhi *devo samantena* for the ordinary Sanskrit *devaḥ samāntena*; again the initial *a* of *anavataptena* and of *aparādjitena* must be dropped or taken as absorbed in the preceding syllable, in order to make the verse (*śloka*) scan; moreover the initial two shorts of

*varuṇena* must be taken to be equivalent to one long, in order to conform the line to the ordinary rules of a śloka; so also in the first half line of the eighth śloka in the first extract, where the two shorts of *subhagā* must be taken as one long. Many more examples of a similar kind might be quoted.

"Now as to the age of the MS., I believe it to be very old and written not later than the end of the 5th century A. D. The style of writing is exactly like that which we meet with in the early Gupta inscriptions, between 450 and 550 A. D. Those may best be seen in Mr. Fleet's volume III of the *Corpus Inscriptionum Indicarum*.

"One of the test letters, for the determination of age, of the Nāgarī alphabet—and the most important one in the present case—is the akshara *ya*. Its original form was ; this changed to  or ; next the left hand loop-line was extended to the point of junction of the perpendicular stroke, . The object of this, of course, was to permit of the letter being written with one continuous movement of the hand. The next step was to dissolve the point of junction, , a natural consequence of quick writing. From this point, the modern form was quickly reached. The whole course of this development is clearly traceable during the period (about 400 to 600 A. D.) of the early Gupta alphabet. The initial forms  and  we find still used throughout in the Allahabad pillar inscription of Samudra Gupta (about 400 A. D., see Fleet, *ibid.*, p. 6), the Udayagiri Cave inscription of Chandra Gupta II (c. 410 A. D., *ibid.*, p. 35), the Bilsad pillar inscription of Kumāra Gupta (415 A. D., *ibid.*, p. 45), the Mathurā image inscription of Skanda Gupta (454 A. D., *ibid.*, p. 263), the Bhitari pillar inscription of Skanda Gupta (c. 460 A. D., *ibid.*, p. 53), the Kahaum pillar inscription of Skanda Gupta (460 A. D., *ibid.*, p. 67), etc. The final form  is already used throughout the Bodhgaya inscription of Mahānāman (588 A. D., *ibid.*, p. 274), and in the Asphad stone inscription of Adityasena (c. 650; *ibid.*, p. 202). The intermediate form  is only found in the Indor copper plate inscription of Skanda Gupta, of 465 A. D. (*ibid.*, p. 68), the Mandasor stone inscription of Kumāra Gupta, of 473 A. D. (*ibid.*, p. 79), the Majhgawan copperplate inscription of Hastin, of 510 A. D. (*ibid.*, p. 106), and the Jaunpur stone inscription of Īśvaravarman of about 520 A. D. (*ibid.*, p. 228). With regard to this intermediate form it is particularly to be noticed, that it occurs side by side with the older forms  or , and that it is exclusively used with the vowels *e* and *o*. Thus we have it in the Indore plate in *yojyam* (line 7); again in the Mandasor inscription in *yo* and *priyo* (line 14); again in the Majhgawan plate in *chhreyo* (line 14), *yo* (line 16), *ye* (line 18); again

in the Jaunpur inscription in *anvadye* (line 2). Now precisely the same practice is noticeable in the main portion of the MS., written in the first variety of the alphabet. The older form is used throughout, except in connection with the vowels *e* and *o*, when the intermediate form is used optionally with the older form. Thus in Plate I, No. I, the intermediate form occurs twice in the 2nd line in *yoga*, and in the 9th line in *kalpayet*. Again in the upper portion of Plate VI of the November Proceedings the intermediate form occurs in the middle of the third line in *lepayet*, and in the beginning of the 6th line in *miṣṛayet*; also twice in the beginning of the 11th line in *prayojayet*. On the other hand we have the older form in Plate I, No. I, 10th line, *chūrṇṇayet*, and in Plate VI of the November Proceedings, 2nd line, *kalpayet*; and both the older and intermediate forms we have in the same Plate VI, middle of 6th line, *prayojayet*. Once I have noticed the intermediate form with the analogous case of the vowel *ai*, viz., in Plate VI, middle of 4th line, *jīvanīyaiś = cha*. The inscriptions show that this intermediate form was peculiar to a particular period, the limits of which may be roughly put down as between 470 and 530 A. D. It is not found in any inscription either before or after these dates. And as inscriptions longer conserve archaic forms of writing than manuscripts, that fact further proves that the date of writing the MS. must fall somewhere within that period, that is, about 500 A. D. I have not noticed the intermediate form of *ya* either in the second or in the third portion of the MS. In both these portions, the older forms are used exclusively; and as these portions were certainly written after the first portion, they confirm the conclusion, that the writing of the whole MS. cannot be placed later than 500 A. D.

“As tending to confirm this conclusion, it may be further noted that throughout the MS., wherever there is any occasion to use a number, whether in the body of the work in numbering ślokas, or on the margin of the leaves in numbering the latter, the ancient practice of employing numeral letters is exclusively followed, while numeral figures are never used. What is more,—there is no trace of the knowledge of the modern system of notation with the help of the zero and the value of position; every numeral sign has its own fixed value, independent of the position it may occupy in a series, there being separate signs for the units, the tens, hundreds, etc. Thus ‘twenty-five’ is not expressed by the signs for ‘two’ and ‘five’ (*i. e.* 25), placed in a certain order, which order imparts the value of ‘twenty’ to the sign for ‘two,’ but it is expressed by two special signs, one for ‘twenty,’ the other for ‘five.’ That the ‘value of position’ was not known to the writer of the second part of the MS., seems



to be clearly shown by his curious system of numbering the several ślokas of a set. Thus the three ślokas of the *śāpaṭa* set are numbered 443, 434 and 344, which does not mean 'four hundred and forty-three,' 'four hundred and thirty-four,' and 'three hundred and forty-four.' This would have no meaning. The position of the figures in the three series imparts no numerical value; 4 means 'four,' and 3 means 'three,' in whatever position they may be. The three series can only be read 'four four three,' 'four three four' and 'three four four;' and the variation in the position of the three unit figures only serves to enumerate three different ślokas. Now the discoveries of the zero and of the value of position may, with much probability, be placed at some time within the sixth century A. D.; and thus the writing of our MS., must be referred to a time, not later than the beginning of that century, or about 500 A. D.

"This, I believe, makes our MS. the oldest Indian written book that is known to exist. There is indeed another MS. which is nearly as old; that is, the so-called Horiuzi MS., published in the *Anecdota Oxoniensia*, Vol. III. But if I understand the case rightly, that MS. consists only of two leaves, and is preserved, not in India, but in Japan. Professor Bühler, who has described it, assigns to it the date of about 550 A. D. The MSS., next in age, are two Nepalese of the Cambridge collection, *viz.*, Add. 1049 and 1702, described in Mr. Bendall's Catalogue, pp. xxxix ff.; and the so-called Bakhshālī MS., described by myself in the *Indian Antiquary*, Vol. XVII, pp. 33ff. It will be observed that both Nepalese MSS. exhibit throughout the modern form of *ya* (though in slightly differing variations) as it became established at the end of the sixth century A. D. As the Bodhgaya inscription of Mahānāman, of 588 A. D., shows throughout the same form of *ya*, it appears to me not impossible that the MS., Add. 1049, dated Samvat 252, which is referred by Mr. Bendall to 857 A. D., may really be placed in 571 A. D. being dated in terms of the Gupta era. Neither the old, nor the intermediate forms of *ya* occur in the Nepalese MSS., while in our MS. these are the only forms that are employed, the modern form being, conspicuous by its entire absence.

"I may note one or two other peculiarities. In the first place, the oldest form of the long vowel *á* is a small horizontal stroke attached to the top of the right side of a consonant. A peculiar modification of this form is the attachment of the stroke to the middle of the right side. This form has, so far as I am aware, hitherto only been noticed in the Allahabad stone pillar inscription of Samudra Gupta, which dates from about 400 A. D., see Fleet, *Corpus Insc. Ind.* Vol. III., p. 4. Compare, e. g., the *akshara* मा of माँ in line 31 of that inscription with the मा of

नाग in line 4 and of संघात in line 5 of the lower part of Plate VI in the November Proceedings. I have noticed this peculiar form of *ḍ* only in the that portion of the MS., which is written in the third variety of the alphabet.

"In the second place a peculiarity of the style of writing of the period of the early Gupta inscriptions is the practice of appending a final consonant, i. e., a consonant without an inherent vowel, below the line in very small size. In fact this practice is the early substitute of the modern *virāma*. Thus compare the very last word पिवेत् in the bottom line, and the word चोरकस् just three lines above it, in the upper portion of the plate in the November Proceedings, again अश्वितस् and नावनीतकस् in line 1, चूर्षयेत् in line 10 of Plate I, No. I, with the word यथावत् in line 11 of the Bilsad pillar inscription of Kumāra Gupta, of 415 A. D. (Fleet, p. 44), or तनीयस् at the end of line 11 of the Kahaum stone pillar inscription of Skanda Gupta, of 460 A. D. (*ibid.*, p. 67), or योगस् at the end of line 9 of the Indoro copperplate of Skanda Gupta, of 465 A. D. (*ibid.*, p. 70), or मुखास् in line 6 of the Gwaliyor inscription of Mihirakula, of about 515 A. D. (*ibid.*, p. 162), or सिद्धस् in line 1, चाध्वरान् in l. 13, भूतयेपात् in l. 17 of the Mandasor inscription of Yaśodharman, of 533 A. D. (*ibid.*, p. 152), or मस् in line 1 of the Jaunpur inscription of Iśvaravarman, of about 520 A. D. (*ibid.*, p. 229). This practice of spelling I have observed throughout every part of the manuscript."

[PS. A fuller account of the MS., and specially of the reasons of dating it so early, I hope shortly to publish.]

The PHILOLOGICAL SECRETARY exhibited 5 Indo-Sassanian and 4 Mughal coins presented to the Society by the Government of Bombay through the Bombay Branch, Royal Asiatic Society.

The PHILOLOGICAL SECRETARY read the following report on a find of Treasure Trove Coins.

Report on four old coins, forwarded by the Secretary to the Government, N.-W. Provinces and Oudh, Financial Department, with his No.  $\frac{3790}{x, 26}$ , dated 3rd June, 1890.

These four coins are stated to form a part of the find which is referred to in my Report of the 9th May 1890.

Three of them belong to precisely the same variety as the four coins, described in that Report. Nor are they in any better state of preservation; and afford no further help in determining the name of the king, who issued them. I may remark, however, that the name

*kritavarman*, as inscribed on the paper, in which the coins were received, is certainly read wrongly. For the reading *varman* there is absolutely no ground on the coins; *krita* may be correct; though the letters on the coin look more like *kriga*.

The fourth coin belongs to the same class of the so-called later Indo-Scythian coins of the "Kida" type; but to a different variety. The obverse shows, as usual, the standing figure of the king, with *keda* under his left arm; under his right arm are two letters कष *kaśa* or रष *raśa*; on the proper left margin there is a mutilated ष *sha*. The reverse shows the seated form of the goddess, and along the proper left margin श्री षष *S'ri Chachcha* with faint traces of another (probably) conjunct letter. The full legend may have been श्री षषष *S'ri Chachchasga*, i. e., "of the illustrious (king) Chachcha." The name "Chachcha" appears to me perfectly clear on the coin; and I am disposed to ascribe the coin to the well-known Rāja Chāch of Sindh, whose history is related in the Chāchnāma (see Sir H. Elliot's History of India, Vol. I, p. 131). He reigned about 650 A. D.

COLONEL WATERHOUSE exhibited some silver and glass plates showing reversed deposits obtained by passing electric currents through photographic 'developers' containing thio-carbamides and said :—

At the meeting of the Society in August last, I exhibited some specimens of a curious reversal of the photographic image produced by adding small quantities of thio-carbamides or sulpho-ureas to the ordinary eikonogen developer, and showed that although reversal of the image was by no means uncommon, it was usually caused by over-exposure or some other abnormal action of light, whereas to produce these new reversals even less than the ordinary exposure was sufficient, and they appeared to be entirely due to some peculiar action of the thio-carbamide added in very minute quantities to an alkaline eikonogen developer.

At that time I was quite unable to offer any opinion as to the probable cause of these reversals, or as to how they were produced, beyond stating the probability that, although there were many points of difference, they would be found to be in accordance with the generally accepted theory worked out by Capt. Abney, and were due more or less to oxidation or rehalogenisation of the exposed parts of the film, and that owing to the peculiar reducing action of the alkaline thio-carbamides the film during development was practically in the same state as if it were over-exposed. It seemed also probable that sulphur was the active agent in producing the reversals.

Further work with these curious salts and especially with a compound salt of thio-carbamide and ammonium bromide, discovered by Prof. J. E. Reynolds in 1868 and called by him tetrathiocarbamid-ammonium bromide, which was found to be exceedingly active in producing perfect reversals of the image with very short exposures, led me to the belief that this complete change of deposit from the lights to the shadows of the photographic image must be more or less due to electro-chemical action. The subject of electro-chemistry is one of which I have little knowledge, but I have been able to make some simple experiments from which, though not conclusive, it seems probable that my surmise is correct, and so far as they go, they seem to establish that not only, as former observations by Lermontoff, Eder and Abney had shewn to be probable, is the ordinary process of photographic development of sensitive surfaces containing silver haloids, accompanied by electrical action, but that the addition of these minute quantities of thio-carbamides to the developer, greatly increases the intensity of the electrical action and produces a reversal of the current which should also account for the reversal of deposit.

With the aid of a very sensitive galvanometer, which has been kindly lent me by the Rev. Fr. Lafont, S. J., who also assisted me in the experiment, it was found that when a pair of pure silver plates coated with finely precipitated silver bromide, one of which had been exposed to light and the other not, were connected to the galvanometer so as to form a galvanic couple and immersed in the ordinary eikonogen developer, the exposed plate formed the negative pole and the needle was deflected to the left; whilst in the developer containing a little thio-sinamine, the exposed plate formed the positive pole and the needle was deflected to the right.

This experiment has been successfully repeated several times with silver plates prepared in the same way and with other thio-carbamides, also with silver plates bromised by dipping them in bromine water; and so far the occurrence of the reversal is well established. I propose to repeat the experiment before you though I cannot be certain of success. (*The reversal was successfully shown with bromised plates, the image of the needle and scale being projected on the wall.*)

I have also tried the same experiment with ordinary dry plates rendered conductive in various ways, the best of which appears to be gold leaf applied either on the face of the film or behind it. Gelatine offers very great resistance to the current, and though I have obtained distinct evidence of currents in both directions, they are not always observable, nor is it yet quite certain that they are caused by electrolytic action within the gelatine film, and further investigation as to this is necessary.

I have also found that reversals of the reduction products, somewhat similar to those obtained by photographic methods, may be obtained entirely without the agency of light by passing a current from a single bichromate cell through a pair of silver plates coated with silver bromide and immersed in eikonogen developers prepared with or without thio-carbamides. In this case the plate attached to the carbon pole in the plain developer showed only a very little black deposit, whilst the plate attached to the zinc pole showed a very strong dark deposit all over. A pair of similar plates immersed in some of the same developer to which a few drops of a solution of thio-sinamine had been added showed quite different results, the plate attached to the carbon pole showing a strong black deposit, while the plate attached to the zinc pole was almost clear on the face and free from deposit, showing only a slight tarnish, caused by sulphur. I have some plates of this kind here, though the reversed effect is not quite so strong as it was on my first plates. I have found it difficult to obtain such marked reversals again though I quite believe they are obtainable and the best conditions for securing successful results have yet to be ascertained.

Some similar effects were produced on Eastman's bromide paper and on ordinary dry plate films attached to the silver plates.

Although results obtained with silver bromide on silver plates are not quite comparable with those obtained with ordinary gelatine plates, these experiments show that under favourable circumstances the action of developing solutions on silver bromide is accompanied by distinct electric action, and that these thio-carbamide reversals may be produced by electrical methods and are attended by a reversal of current. How this reversal of current is brought about is not yet quite clear, but seems to be explained by some observations on metallic sulphides, by W. Skey, recorded in Vol. XXIII of the *Chemical News*. He found that sulphides which have the power of conducting can also generate electricity and that silver sulphide is positive to metallic silver. In a battery consisting of a sulphide and a metal in acidulated water, the gas liberated is sulphuretted hydrogen, the nascent hydrogen exerting a desulphurising action upon the metallic sulphide, the ultimate effect of which is in some cases to completely reduce the mineral to the metallic state. He shows also that these sulphides are capable of performing the functions of the negative element of a galvanic couple.

It seems probable, therefore, if electrolytic action does take place in gelatine films during the process of photographic development, that, according to the laws of electrolysis, with the ordinary developers the exposed parts of the plate form the negative pole and attract the metallic elements and hydrogen, while the bromine, or other halogen and

acid radicals, with the hydroxyl go to the unexposed parts forming the positive pole.

On the other hand, with the alkaline thio-carbamide developers, at the same time that silver is reduced on the exposed parts, silver sulphide is formed on the unexposed parts which then become the negative pole and attract the sulphur, the hydrogen and some of the silver from the exposed parts; while the halogen and hydroxyl pass to the positive pole and transform part of the remaining silver into silver haloid which is dissolved in the fixing bath.

Although this theory, as stated in a rough way, seems to agree fairly well with the facts, and from the experiments I have made seems probably the correct explanation of the reversals, I do not feel myself yet able to put it forward authoritatively, and a great deal of further investigation is required. The subject is a very difficult one beset with uncertainties, and requires more time and close attention than I have been able to give for working it out fully.

The theory that photographic action is accompanied by electrical phenomena is no new one. Becquerel found that if silver plates coated with silver bromide or other haloid silver salts were electrically connected and immersed in dilute acid, and light was allowed to fall upon one plate while the other was screened, the effect of the light was marked by distinct electrical action capable of deflecting the needle of a galvanometer. Prof. Minchin has recently found that the same effect is produced on silver plates coated with silver haloids in emulsions of gelatine or collodion, and immersed in very dilute solutions of alkaline bromides, iodides or chlorides. He has also found that if silver plates coated with a silver bromide emulsion in gelatine are attached to the poles of a battery, and half immersed in a weak solution of potassium bromide, the film attached to the carbon pole was visibly blackened on its immersed part, while no visible effect was produced on the other, but on developing this plate with pyrogallie acid and ammonia, its immersed part also became dark, exactly as if it had been exposed to light for a few seconds.

There is a good deal of other more or less direct evidence that an electrolytic action takes place during development, although so far as I can ascertain no observations of the currents with a galvanometer are recorded. Comparatively little attention has, however, been given to the question, and electrical or electrochemical action has never been looked upon as a principal factor in the production of the photographic image. From these new results it would appear that, at any rate as regards the silver haloids, the formation and development of the photographic image is to a very great extent influenced by electrical action,

if not actually caused by it. It has lately been found that electro-chemical reactions have explained many obscure points in ordinary chemistry, and it seems likely therefore that further investigation of photographic action by the light of the most recent electro-chemical theories would also throw light on much that is now obscure and uncertain as regards the formation and development of the invisible photographic image. Prof. Meldola in his "*Chemistry of Photography*" notes these micro-electrical phenomena in photography as subjects for further investigation, and I hope these experiments may prove a useful contribution to the investigation.

Bábu SARAT CHANDRA DÁS exhibited and read a short note on a drawing of the Paradise of the Northern Buddhists called De-wa-chan in Tibetan and "Sukhávati" in Sanskrit. (With a plate).

*A Short note on the Paradise of the Northern Buddhists.*

The inscription on the top of this Tibetan drawing of "Sukhávati" the paradise of the northern Buddhists is, in the rectangular form of the Sanskrit character of the 6th—7th century A. D. Transliterated into Roman character, it stands thus :—

Sukhávati hí śiñ bkod tshe phyi mahí

\*Mthoñ var byed-pa shes bya-va.

"The design of Sukhávati world called 'the prospective of future existence.'"

. This imaginary world, believed by the Buddhists of the Maháyána school to be a reality, lies far to the west beyond numberless worlds. In physical aspect, general character &c., it is said to resemble this world of ours, but the great law of procreation which is the prime cause of all that have life in this world does not prevail in Sukhávati. There all living beings are born, not from the effect of their former deeds, but in consequence of their moral merits and prayers. A pious Buddhist of this world prays, for being born into Sukhávati. When at the time of his death he sees, the Buddha and his sainted followers either in sleep or in wakeful dreams, he is sure to be born in Sukhávati. His soul instantaneously travels many millions of miles westward and enters a lotus blossom which serves him for a womb. In course of time he grows out of the lotus flower and develops into a full grown man. He is found endowed with the power of comprehension, meditation and foreknowledge, and is soon able to work miracles. Women

\* The italics are silent.

have no place there and the agency of the sexes is altogether unknown in Sukhāvati. Indeed *kāma* that faculty of procreation which is, the cause of all worldly miseries, according to the Buddhists does not at all exist there. In this paradise *Amitābha* the Buddha of immeasurable light rules supreme in love. *Avalokitesvara* Bodhisattva, with a lotus in his hand sits to the right and *Vajra Pāni* has his seat on the left. Two rays of divine light emanating from the heart of the Supreme Buddha, travel east- and west-ward, touching a saintly Lama and a Buddha who has attained perfection, and will not go back to the world. This Lama in the present *kalpa* is the grand Lama of Tashilhunpo whose spirit is in Sukhāvati, but who of his own free-will chooses, for the good of all living beings of this world, to reside in flesh in the holy land of Tibet.

The Buddha's place is taken by successive arrivals. Fine trees, lovely flowers, fragrant shrubs abound in Sukhāvati. Birds of richest hues and plumage and sweetest notes fly, freely in Sukhāvati. The beasts of forests roam at large without doing mischief to each other. The woods resound with the chorus of divine music. In that blessed land there is no distinction between the day and the night. The gods, whose robes serve them for wings, approach the supreme Buddha from all directions with wreathes of plumes, crowns of gems, jewelled umbrellas and flags in their hands. They and the Bodhisattvas wait round him like Parnett's saints—"With harps of gold, with boughs of ever green. With robes of white, the pious throngs are seen; Exalted anthems all their hours employ. And all is music and excess of joy." Divine lustre—halos of light emanating from the persons of the saints and Buddhas keep all nature illumined. The hard soil becomes soft and yields to the feet, and the soft earth grows hard when the mind wishes for it.

There the food of contemplation furnishes nourishment to the residents of Sukhāvati. Their wealth consists of love and enjoyment, of meditation, their vestments are self grown on their person nor have they shame to cover. It is a land which is free from lust, envy, rage, ignorance and stupidity.

Once born there, one does not transmigrate elsewhere, but goes on ascending to the stages of sainthood. He is liberated from the effects of *karma*. The gods who in this world are subject to fall at the exhaustion of their moral merits—may by dint of prayers have their births in Sukhāvati—and draw near *Amitābha* guided by his light. I here extract a few lines from the *Dhāraṇī* called "the drum-sound of immortality."



འདི་ནས་ཉུང་གི་ཕྱོགས་རེལ་ན།  
 བདེ་བ་ཅན་གྱི་འཇིག་རྟེན་ཁམས།  
 དེ་ན་ཇོགས་པའི་སངས་གྱུས་བཞུགས།  
 དེ་བཞིན་གཤེགས་པ་འོད་དཔག་མེད།  
 སུ་ཞིག་དེའི་མཚན་བཟོད་ན།  
 དེ་ནི་དེ་ཅུ་སྟེ་བར་འགྱུར།  
 འཆི་བའི་དུས་སུ་སྟོན་པ་ནི།  
 དག་སྟོང་དག་འདུན་བཅས་ཏེ་མཐོང་།  
 དེ་ན་བྱད་མེད་ཡོད་མ་ཡིན།  
 མངལ་ན་གནས་པ་ཡོད་མ་ཡིན།  
 རིན་ཆེན་ནྟམས་ཀྱི་བད་མོ་ལས།  
 རྩོམ་ལ་ཆེན་པོ་འབྱུང་བར་འགྱུར།  
 ཟས་དང་གོས་དང་སྟོན་ནྟམས་དང་།  
 ཆོས་གོས་སལ་ཆ་ལྷུང་བཟེད་ནྟམས།  
 སེམས་ཀྱི་བསམས་མ་ཐུག་དུ་ནི།  
 དེ་དག་མོད་ལ་འབྱུང་བར་འགྱུར།  
 ཕྱོགས་བཅུར་བཞུགས་པའི་སངས་གྱུས་ནྟམས།  
 བདེ་བ་ཅན་གྱི་བསྐྱབས་པ་བཟོད།  
 \* \* \* \* \*  
 ནྟམ་དག་ཞིང་དུ་སྟེ་བར་འགྱུར།

(འཆི་མེད་ངོ་སྟོན་གྱི་གཞུགས་ལས་)

Far to the west lies De-va-chan,\*  
 That happy land of Buddhist bliss ;  
 Where reigns the saintly sovereign,  
 Amitâbha, of Light—boundless.  
 Who e'er His name in faith implores,  
 On re-birth gains that blessed land ;  
 His dying eyes shall see the Lord—  
 The Teacher and his priestly band.  
 No women there, nor fleshly birth ;  
 But from a diamond lotus flower  
 Bursts blooming forth the new born soul.  
 In the glorious company of  
 Amitâbha our needs are few,  
 But food and drink and raiment rare  
 And alms-bowl all appear when wished.  
 The Buddhas of the quarters ten  
 Unite in praise of De-va-chan ;  
 Our prayer hence will e'er be this  
 "To be born in that Paradise."

N. B.—Buddha, Amitâbha and Amitâyusa are the different manifestations of the same spiritual entity.

COL. J. WATERHOUSE submitted a communication from Mr. W. McCarren, Manager of the Arakan Oil Company's works, Kyouk Phyo, and said :—

At the August meeting, after the reading of Col. Mainwaring's paper on his new theory of the Barisal Guns I remarked that on reading a paper by Prof. Redwood on the Oil-wells of India, which was published last year in the *Journal of the Society for Chemical Industry*, and in which mention was made of gas explosions occurring in the Islands of Cheduba and Ramree from the mud volcanoes, it seemed not impossible that with favourable conditions of wind and atmosphere the sound of these explosions if loud enough might be carried across the Bay of Bengal so as to be heard in the localities where the Barisal Guns are heard.

On looking up a paper in Vol. XI of the *Records of the Geological Survey of India*, by Mr. Mallett on "the Mud Volcanoes of Ramri and Cheduba," referred to by Prof. Redwood, I found it stated that these explosions of gas were said by the natives to be most frequent in the rainy season.

\* De-va-chan is the Tibetan of Sukhâvati.

It struck me, therefore, that the question might at any rate be worth enquiring into, and as I found that the Arakan Oil Company's works were established at Kyouk Phyoo, on the island of Ramri, I asked my friend Mr. J. D. Maxwell, of Messrs. Kettlewell, Bullen and Co., the managing agents of the Company, to forward some questions on the subject to Mr. W. McCarren the manager of the works. This he kindly did, and I lately received the following note by Mr. McCarren, from which it will be seen that although the gas explosions referred to cannot possibly be the source of the sounds known as the Barisal Guns, the fact of similar sounds being heard on the Island as coming from the *west* at the commencement and end of the monsoon is interesting, and points to the sea as being in some way the place of origin of the sounds.

It may also be remarked that Prof. Pedler has very kindly had prepared for me some charts showing the direction of the winds at the head of the Bay during the Monsoon months, and from these it would appear that the winds are favourable to sounds being carried across from the Ramri Islands to the Sunderbunds, supposing that they were sufficiently loud.

The further information Mr. McCarren has kindly promised will be of interest, and the Society is much indebted to him for the trouble he has taken in the matter.

*Note by Mr. W. McCarren.*

1. Do explosions of gas occur from the mud volcanoes or from the petroleum wells in the islands of Ramri, Cheduba and the Borongas ?

Explosions of gas occur from the mud volcanoes of Ramri and Cheduba but not from the petroleum wells.

2. If so, at what season of the year are they most frequent and are they accompanied by much noise, loud enough to be heard at a considerable distance ?

There is only one volcano on these islands that has explosions of gas accompanied with much noise and flame. This volcano is in Cheduba and explodes once in every 6 to 8 months. I have heard the sound (which was not very loud) of the explosion at Kyouk Phyoo 40 miles north of the volcano. I have made enquiries at Akyab 100 miles north of the volcano, no one living there (Akyab) that I could find ever heard the sound of any explosion of the Cheduba volcano, although numbers have seen the flames of the eruptions which generally during the time (7 years) I have been here, have taken place at night time.

3. What is the direction of the prevailing wind at the time when the explosions are the most frequent?

The wind was blowing from the N. W. when the last explosion occurred.

4. Is the noise accompanying them sufficiently loud to be heard at a great distance; and is it possible that it could be heard on the other side of the Bay of Bengal?

From enquiries I have made, and the number of times I have heard the noise accompanying the explosion, I do not think the sound could be heard at over 70 miles.

The natives here tell me that in April and May near the commencement of the rains they hear three or four very loud reports coming from the west, *i. e.*, the sea. That those reports are entirely different from the sounds produced by the surf on the coast, and are like the reports from the firing off of cannon. That in August and September near the end of the rains they hear the same sort of sounds which are again three or four in number,—that during no other time of the year do they hear these sounds. They of course cannot tell what are the causes of these reports, but they think they are in connection with the beginning and ending of the rains.

I have made arrangements with the headmen of the different villages along the coast, that when they hear these reports this year to come and give me the particulars. I will be on the *qui vive* myself and trust I will be able to get the exact date of each report.

The following paper was read:—

1. *Materials for a Flora of the Malayan Peninsula, No. 3.* By GEORGE KING, M. B., LL. D., F. R. S., F. L. S., *Superintendent of the Royal Botanic Garden, Calcutta.*

The paper will be published in the Journal, Part II.

## LIBRARY.

The following additions have been made to the Library since the meeting held in March last.

## TRANSACTIONS, PROCEEDINGS AND JOURNALS,

*presented by the respective Societies and Editors.*

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Boston. Boston Society of Natural History,—Memoirs, Vol. IV, Nos. 7—9.

———. ———. Proceedings, Vol. XXIV, Parts 3 and 4.

Budapest. La Société Hongroise de Géographie,—Bulletin, Tome XIX, Fasc. 1 et 2.

Calcutta. Geological Survey of India,—Memoirs, Vol. XXIV, Part 3.

———. Indian Engineering,—Vol. IX, Nos. 10—13.

———. Photographic Society of India,—Journal, Vol. IV, No. 3.

Colombo. Ceylon Branch of the Royal Asiatic Society,—Journal, Vol. X, No. 37.

Florence. La Società Africana d' Italia,—Bullettino, Tome VI, Fasc. 7.<sup>o</sup> e 8.<sup>o</sup>.

Havre. Société de Géographie Commerciale du Havre,—Annuaire, Janvier, 1891.

Leipzig. Der Deutschen Morgenländischen Gesellschaft,—Zeitschrift, Band XLIV, Heft 4.

London. Geological Society,—Quarterly Journal, Vol. XLVII, Part 1.

———. Institution of Electrical Engineers,—Journal, Vol. XX, No 91, and Index to Vol. XIX.

———. ———. List of Officers and Members, corrected to January 31st, 1891.

———. Nature,—Vol. XLIII, Nos., 1111—15.

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———. ———. Compte Rendu des Séances, Nos. 2—5, 1891.

Rio de Janeiro. Observatorio do Rio de Janeiro,—Revista do Observatorio, Anno VI, No. 1; Index, Anno V.

Rome. La Società Degli Spettroscopisti Italiani,—Memoire, Tome XX, Disp 1<sup>a</sup>.

Roorkee. The Indian Forester,—Vol. XVII, Nos. 1—3.

Taiping. Government of Perak,—The Perak Government Gazette, Vol. IV, No. 5.

Tōkyō. Asiatic Society of Japan,—Transactions, Vol. XVIII, Part 2.

du ———. Kaiserlich-Japanischen Universität,—Mitteilungen aus der medicinischen Facultät, Band I, No. 4.

este. Museo Civico di Storia Naturale di Trieste,—Atti, VIII.

- Turin. La R. Accademia delle Scienze di Torino,—Atti, Tome XXVI, Disp. 1<sup>a</sup>—3<sup>a</sup>.
- Vienna. Der K. K. Geologischen Reichsanstalt,—Verhandlungen, Nrn. 14—18, 1890; Nr. 1, 1891.
- Yokohama. Der Deutschen Gesellschaft für Natur und Völkerkunde Ostasiens in Tokio,—Mittheilungen, 45 Heft.

### BOOKS AND PAMPHLETS,

*presented by the Authors, Translators, &c.*

- ADITYARÁMJI, KESHAVLÁL AND LAXMIDÁSS. Sangeetáditya, Part I. By Shástri Adityarámji. 8vo. Bombay, 1889.
- MITRA, VIHÁRILÁLA. The Yoga-Vásishtha-Maháramáyana of Válmiki, translated from the original sanskrit, Vol. I. 8vo. Calcutta, 1891.
- STORER, HORATIO R., M. D. The Medals of Benjamin Rush, Obstetrician. 8vo. Chicago, 1889.
- . The Medals, Jetons and Tokens illustrative of Obstetrics and Gynæcology. 8vo. 1887.

### MISCELLANEOUS PRESENTATIONS.

- Proeve van een Lampongsch-Hollandsche Woordenlijst, bepaaldelijk voor het dialect van Kroö, door O. L. Helfrich (Verhandelingen van het Bataviaasch Genootschap van Kunsten en Wetenschappen, Deel XLV, 3<sup>e</sup> stuk). 8vo. Batavia, 1891.
- Verzameling Lampongsche Teksten, getranscribeerd onder toezicht van O. L. Helfrich (Verhandelingen van het Bataviaasch Genootschap van Kunsten en Wetenschappen, Deel XLV, 4<sup>e</sup> stuk). 8vo. Batavia, 1891.

BATAVIAASCH GENOOTSCHAP VAN KUNSTEN EN WETENSCHAPPEN, "

BATAVIA.

- Botany: Contributions to the Queensland Flora. By F. M. Bailey, F. L. S. (Bulletin, Department of Agriculture, Brisbane, No. 4). 8vo. Brisbane, 1890.
- Tobacco: Its Cultivation in Northern Queensland. By S. Lamb (Bulletin, Department of Agriculture, Brisbane, No. 6). 8vo. Brisbane, 1890.

DEPARTMENT OF AGRICULTURE, BRISBANE.

- Contents and Index of the First Twenty Volumes of the Records of the Geological Survey of India, 1868 to 1887. 8vo. Calcutta, 1891.

GEOLOGICAL SURVEY OF INDIA.

- The Indian Antiquary, Vol. XX, Part 244, February, 1891. 4to. Bombay, 1891.

GOVERNMENT OF INDIA, HOME DEPARTMENT.

Annual Administration Reports of the Forest Department (Southern and Northern Circles), Madras Presidency, for the official year 1889-90. Fcp. Madras, 1890.

Mr. A. Rea's Report on the Archæological Survey of Southern India during the last quarter of 1890. Fcp. Madras, 1891.

GOVERNMENT OF MADRAS.

A Catalogue of the Mantodea, with descriptions of new genera and species, and an enumeration of the specimens, in the collection of the Indian Museum, Calcutta. By J. Wood-Mason. 8vo. Calcutta, 1891.

INDIAN MUSEUM.

Den Norske Nordhavs-Expedition, 1876-1878. XX, Zoologi. Pycnogonidea ved G. O. Sars. 4to. Christiania, 1891.

DEN NORSKE NORDHAVS-EXPEDITION, CHRISTIANIA.

Catalogue of Notices to Mariners issued during the year 1890. 8vo. Calcutta, 1891.

PORT OFFICER, CALCUTTA.

Scientific Memoirs by Medical Officers of the Army of India. Edited by W. R. Rice, Esq., M. D. Part VI, 1891. 4to. Calcutta, 1891.

SANITARY COMMISSIONER WITH THE GOVERNMENT OF INDIA.

North American Fauna, No. 3. Results of a Biological Survey of the San Francisco Mountain Region and Desert of the Little Colorado, Arizona. By Dr. C. Hart Merriam. 8vo. Washington, 1890.

North American Fauna, No. 4. Descriptions of twenty-six new species of North American Mammals. By Dr. C. Hart Merriam. 8vo. Washington, 1890.

UNITED STATES DEPARTMENT OF AGRICULTURE, WASHINGTON.

PERIODICALS PURCHASED.

Calcutta. Indian Medical Gazette,—Vol. XXVI, No. 3.

Genève. Archives des Sciences Physiques et Naturelles,—Tome XXV, No. 2.

Leipzig. Annalen der Physik und Chemie,—Band XLII, Heft 3.

London. The Chemical News,—Vol. LXIII, Nos. 1629—33.


Paris. Revue Scientifique,—Tome XLVII, Nos. 7—11.

BOOKS PURCHASED.

PETERSON, PETER. The Paddhati of Sarngadhara. A sanskrit anthology. Vol. I, Text (Bombay Sanskrit Series, No. XXXVII). 8vo. Bombay, 1888.

POOLE, REGINALD STUART. Catalogue of Coins of the Sháhs of Persia in the British Museum. The Coins of the Sháhs of Persia, Šafavis, Afgháns, Efsháris, Zands, and Kájárs. 8vo. London, 1887.

— . Catalogue of Indian Coins in the British Museum (The Muhammadan States). The Coins of the Muhammadan States of India in the British Museum. By Stanley Lane-Poole. 8vo. London, 1885.







PROCEEDINGS  
OF THE  
ASIATIC SOCIETY OF BENGAL,  
FOR MAY, 1891.

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The Monthly General Meeting of the Asiatic Society of Bengal was held on Wednesday the 6th May, 1891, at 9-15 P. M.

J. WOOD-MASON, Esq., Vice-President, in the chair.

The following members were present :—

Nawáb Abdul Latíf, Bahádur, Rev. H. B. Hyde, Dr. W. King, Rev. Fr. E. Lafont, T. H. D. La Touche, Esq., C. Little, Esq., Kumár Rameswár Maliáh, T. R. Munro, Esq., L. de Nicéville, Esq., R. D. Oldham, Esq., W. L. Sclater, Esq.

Visitors : D. Munro, Esq., Dr. W. W. Sheppard.

The minutes of the last meeting were read and confirmed.

Nineteen presentations were announced, details of which are given in the Library List appended.

The following gentleman, duly proposed and seconded at the last meeting of the Society, was ballotted for and elected an Ordinary Member :—

C. R. Wilson, Esq.

The following gentlemen are candidates for election at the next meeting :—

Rev. D. G. Lathom-Browne, Chaplain, Port • Blair, Andamans, proposed by Dr. G. King, seconded by Dr. D. Prain.

F. A. Shillingford, Esq., Kolassy Factory, Purneah, proposed by C. Little, Esq., seconded by Dr. A. F. R. Hoern

The following gentleman has expressed a wish to withdraw from the Society :—

C. A. Samuells, Esq., C. S.

The PRESIDENT stated that the votes of the members on the proposed investment of Rs. 50,000 of the Society's *Permanent Reserve Fund*, reported at the meeting in February last, would now be taken, and appointed Dr. W. King and Mr. T. R. Munro to be scrutineers, who reported the result as follows :—

|          |     | <i>For</i> | <i>Against</i> | <i>Result.</i> |
|----------|-----|------------|----------------|----------------|
| Proposal | I   | 76         | 6              | Carried.       |
| Do.      | II  | 18         | 64             | Rejected.      |
| Do.      | III | 5          | 77             | Rejected.      |
| Do.      | IV  | 53         | 29             | Rejected.      |

The SECRETARY stated that it was resolved in the last meeting of Council, in the event of Proposal IV not being carried, that one proposal only should be laid before the members, as, with the large majority required by the rules of the Society, it is difficult to obtain a satisfactory result when so many proposals are before the members at once. The permission of the meeting was therefore asked with a view to a re-circulation of Proposal II, *viz.*, that the sum of Rs. 50,000 should be invested in Municipal Debentures.

Permission was granted.

The PRESIDENT read a letter from the Committee of Organization, Fifth International Congress of Geologists, Washington, inviting attention to a circular respecting the next meeting of the International Congress of Geologists and requesting to bring its contents to the notice of the Council and members of the Society.

The PHILOLOGICAL SECRETARY read the following reports on finds of Treasure Trove Coins :—

I. Report on 10 silver coins forwarded by the Deputy Commissioner of the Akola District with his No. 3294, dated 26th May, 1890.

The coins are stated to have been found near the village Umra Attali in the Khamgaon Taluk of the Akola district, whilst excavating for the building of a wall for a temple. Altogether 462 coins are stated to have been found, of which ten were sent as samples for identification.

They are Rupees of Sháh 'Alam, of native mintage, and are of no numismatic value. They have been sent to the mint to be melted down.

II. Report on 29\* so-called Alamsháhi Rupees " forwarded by the

Deputy Commissioner of Hoshangabad with his No. 4555, dated the 6th September, 1890.

The coins are stated to have been found on the 10th May 1889 in the village of Rámpúr in Seoni Tahsil in the Hoshangabad district, and to be "so-called Alamsháhi Rupees."

As a matter of fact, they are Rupees of the following Mughal emperors of Delhi :

|                  |              |
|------------------|--------------|
| 1, Sháh Jahán    | 3 specimens. |
| 2, Aurangzíb     | 6    "       |
| 3, Aḥmad Sháh    | 1    "       |
| 4, Farukhsiyar   | 2    "       |
| 5, Muḥammad Sháh | 8    "       |
| 6, 'Alamgír II   | 1    "       |
| 7, 'Alam Sháh    | 8    "       |
| <hr/>            |              |
| Total            | 29    "      |
| <hr/>            |              |

These Rupees are all of very common kinds and moreover in indifferent condition. They have been sent to the mint to be melted down.

III. Report on 5 coins forwarded by the Offg. Collector of Durbhanga with his No. 687G, dated 9th September, 1890.

The find place of these coins is not stated in the Collector's letter. It would be well, if this item of information were always supplied.

All the five coins are Rupees of 'Alam Sháh's reign, dated "San 19 Mint Murshidábád," but of English mintage.

They are of no numismatic value, and have been sent to the mint to be melted down.

IV. Report, on 82 silver coins, forwarded by the Deputy Commissioner of Dharmasala, Kangra District, with his No. 1680 of the 17th October 1890.

These coins appear to belong to a set of 101 coins which were found buried by a roadside in the Hamírpur Tahsil of the Kángará District; they were dug up in the course of road-making in March 1873. A few pieces were sent in April following to the Provincial Museum—I presume, in Lahore; and nine specimens would appear to have been taken by the District officers in 1874 with a view to enquiry. The remainder—apparently the 82 specimens now sent for determination—seem to have been deposited in the store room of the district office, where they were re-discovered in October last, and forwarded to the Asiatic Society of Bengal. Owing to my absence from Calcutta on

farlough, they could not be determined till now. Of the 82 coins sent down, 79 were whole, and 3 broken.

All the 82 specimens are of one kind, and belong to the class, commonly called "Indo-Sassanian." They are described and figured in Prinsep's *Indian Antiquities* (ed. Thomas), Vol. I, p. 407, Plate XXXIII, figs. 9, 14. Coins of this description have been found, at various times and in different localities, in large numbers. All collections are well supplied with them. They have been sent to the mint to be melted down.

Rev. H. B. HYDE exhibited a transcript of the Original Returns of Baptisms, Marriages and Burials received from Calcutta by the Court of Directors between 1713 and 1754.

He said :—The Original Registers of the Presidency Church were destroyed in 1756 and since then until these transcripts were received last month, it has perhaps been quite unknown in Calcutta that such duplicates now copied were in existence. These transcripts are to be lodged in the Registry of St. John's Church.

The following papers were read :—

1. *New and Rare Indian Lycænidæ.*—By WILLIAM DOHERTY, Cincinnati, U. S. A. Communicated by the NATURAL HISTORY SECRETARY.

2. *The Butterflies of Sumba and Sambawa with some account of the Island of Sumba.*—By WILLIAM DOHERTY, Cincinnati, U. S. A. Communicated by the NATURAL HISTORY SECRETARY.

3. *Natural History Notes from H. M.'s Indian Marine Survey Steamer "Investigator,"* Commander R. F. HOSKYN, R. N. commanding. No. 24.—*List of Deep-Sea Holothurians collected during the seasons 1887 to 1891 with descriptions of new species.*—By DR. J. H. TULL WALSH. Communicated by the SUPERINTENDENT OF THE INDIAN MUSEUM.

4. *On an undescribed Oriental species of Nepeta.*—By D. PRAIN.

5. *Noviciæ Indicæ. IV. Two additional species of Glyptopetalum.*—By D. PRAIN.

These papers will be published in the Journal, Part II.

6. *On the present condition of Barren Island.*—By D. PRAIN.

Barren Island has been so often described that there is little left to say concerning its physical condition. In his exhaustive account of the island (*Memoirs of the Geological Survey of India*, xxi, part 4) Mr. Mallet has, however, suggested (*l. c.*, p. 30) that future visitors should note "the temperature of the hot spring" at the landing place and "the thickness of the fresh and undisturbed sulphur-crusts." This the writer, owing to the kindness of Col. T. Cadell, v. c., Chief Commissioner of the Andamans, had an opportunity of doing in April 1891.

The column of steam from the crater which was "visible from the "landing-place or even some distance out at sea" to Mr. Mallet (*l. c.*, p. 23) in February 1884 and was "barely visible at 3 miles distance" to Capt. A. Carpenter in 1886 (*Records, Geol. Surv., India, xx*, 48) was no longer visible from these points in April 1891; on ascending the cone, however, steam was found to issue still at the places indicated in Mr. Mallet's memoir. The most copious discharge was still from the *solfatara* on the inner aspect of the north side of the crater.

A deposit of sulphur of an average thickness of  $2\frac{1}{2}$  inches had been laid down on this *solfatara* since 1884. On the other *solfataras* far less had been deposited; the crusts on the two next largest—that on the inner aspect of the south side of the crater and that outside the crater on the north-east face of the cone—were but  $\frac{3}{4}$  in. to 1 inch thick. The new crusts were very similar to the old ones described by Mr. Mallet (*l. c.*, p. 18) except as regards thickness; when pieces were removed, however, they were found to be looser in texture and more friable than the fragments of the old deposit that lay scattered about the crater and in estimating the present value of the *solfataras* as a sulphur-supply this should perhaps be taken into account. The temperature of the steam at the point of issue was not determined in 1891, but it can hardly be as hot now as in 1884—it was then  $219^{\circ}$  F.—since there was no crevice in which it was impossible to place one's hand for at least a few seconds.

In taking the temperature of the hot spring Mr. McCausland, Commander of H. M. I. M. *Nancowry* very kindly assisted me. At high tide there was no trace of percolation of water through the shingle of the small landing-place beach, but when the tide had ebbed water was found to ooze through this shingle at five different points round the head of the bay. Having scooped out pools sufficiently deep for complete immersion of a thermometer at these spots we took temperatures in as nearly as possible the fashion described by Mr. Mallet (*l. c.*, p. 26). In the most northerly small pool (furthest from the recent lava), the thermometer registered  $102^{\circ}$  F.; in the next pool towards the lava,  $103^{\circ}$  F.; then  $104^{\circ}$  F.; then  $106^{\circ}$  F.; finally in the pool nearest of all to the recent lava  $104^{\circ}$  F.; Mr. Mallet found that in 1884 the temperature of the different springs increased with their proximity to the recent lava; the discrepancy of our results as regards the last pool and that next adjacent to it (which, though five yards further from the \*lava was nevertheless  $2^{\circ}$  F. warmer) from the experience of Mr. Mallet led us to repeat the whole observation and to take the temperatures in these two last pools several times; our results were, however, the same

on each occasion. There appears to have been more water in the spring at the time of Mr. Mallet's visit (Feb.) than when our observations were made (April) for he found it possible to take temperatures in seven places while we could only do so in five.

This spring was formerly much hotter than it is now, but unfortunately the early observations are not at all definite: 'as hot almost 'as if it had been boiling' (commander of a vessel, 1832); 'temperature too high to be borne with the hand' (Playfair, 1837); 'natural boiling spring' (Mouat, 1857); 'nearly at the boiling point' (Liebig 1858); 'scalding hot' (Parish, 1862). The observations made since 1862 being more precise are here appended:—

| Date.          | Temperature of Spring.         | Authority.                                                                |
|----------------|--------------------------------|---------------------------------------------------------------------------|
| April, 1866    | 158° F. and 163° F.            | Andaman Committee,<br><i>Report in Proc. As. Soc. Beng.</i> 1866, p. 213. |
| March, 1873    | 130° F. (highest observed)     | Ball, <i>Rec. Geol. Surv. India</i> , vi, p. 87.                          |
| February, 1884 | 106°—116° F.                   | Mallet, <i>Mem. Geol. Surv. India</i> , xxi, pt. 4, p. 26.                |
| April, 1886    | 110° F. (solitary observation) | Daley, <i>Rec. Geol. Surv. India</i> , xx, 48.                            |
| April, 1891    | 102°—106° F.                   | Prain.                                                                    |

The observations given in this table are not of quite equal value because they have not been taken on a uniform principle. The Andaman Committee above referred to (Dr. Gamseks, Lt. Laughton and Mr. Homfray) describe the spring accurately as issuing from underneath the lava across the small bay, but though Mr. Ball (*l. c.*) speaks of them as recording the temperature "at from 158° to 163°" the statement in their report is that at low tide in one place the temperature was found to be 163° F., and at another 158° F. We cannot therefore be certain that these figures give either the maximum or the minimum temperature in 1866, though it is highly probable even if one of them represents a limit that they do not exhibit the full range of temperature at that time. Mr. Ball's observation is rather more precise; the highest temperature is given as 130° F. taken close to high-water mark where the spring bubbles up; unfortunately he does not give the range of temperature in 1873. In connection with this it should be noted that Mr. A. O. Humo, speaking of this very observation, says

(*Stray Feathers* ii, 104) "the thermometer showed a temperature of "nearly 140° F." This remark occurs in the narrative portion of a paper on the ornithology of the islands of the Bay of Bengal and is clearly written from memory only; attention is drawn to it now merely in order to prevent any one who may subsequently read the statement from relying upon it as exact. Mr. Mallet's observations are very comprehensive and precise. Only the bare result of Mr. Daley's observation is given and only one temperature is mentioned: it is not stated that it was the highest, and it is possible that the temperature was taken at one spot only.

The rate of cooling of the spring as indicated by the various highest readings of the preceding table is shown in the table subjoined:—

| Period. | No. of years. | Amt. of cooling.   | Rate <i>per annum</i> . |
|---------|---------------|--------------------|-------------------------|
| 1866-73 | 7             | 83° F. or 18·30°C. | 4·7° F. or 2·6°C.       |
| 1873-84 | 11            | 14° F. or 7·70°C.  | 1·2° F. or 0·6°C.       |
| 1884-86 | 2             | 6° F. or 3·3°C.    | 3·0° F. or 1·7°C.       |
| 1886-91 | 5             | 4° F. or 2·2°C.    | 0·8° F. or 0·4°C.       |

The rates *per annum* shew that the existence of an error in the 1886 observation is not only possible but highly probable; the spot selected for examination can hardly have been that in which the temperature was highest at the time. If it be neglected the rate *per annum* for the whole 1884-91 period is  $\frac{1}{7}$ ° or 1·4° F. (=0·7°C.) a rate that, allowing for errors unavoidable in such observations, is practically uniform with that during the 1873-84 period. Between 1866 and 1873 it cooled nearly four times as fast as it has cooled since; if the 1886 observation is correct, six times as fast as it is cooling now. If the rate continues uniform henceforth the spring will, if the 1886 observation be correct, probably cease to deserve the appellation "hot" by 1925, if the 1886 observation was *not* taken where the water was hottest at the time, the spring will probably be cool by 1910.



## LIBRARY.

The following additions have been made to the Library since the meeting held in April last.

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## TRANSACTIONS, PROCEEDINGS AND JOURNALS,

*presented by the respective Societies and Editors.*

- Baltimore. Johns Hopkins University,—American Chemical Journal, Vol. X, No. 86.
- Batavia. Bataviaasch Genootschap van Kunsten en Wetenschappen,—Notulen, Deel XXVIII, Aflevering, 4.
- . ———. Tijdschrift voor Indische Taal-, Land-en Volkenkunde, Deel XXXIV, Aflevering, 3 en 4.
- . Koninklijke Natuurkundige Vereeniging in Nederlandsch-Indië,—Natuurkundig Tijdschrift voor Nederlandsch-Indië, Deel L.
- Bombay. Bombay Natural History Society,—Journal, Vol. V, No. 4.
- . The Indian Antiquary,—Vol. XIX, Part 242; XX, 245 and 246.
- Calcutta. Geological Survey of India,—Records, Vol. XXIV, Part I.
- . Indian Engineering,—Vol. IX, Nos. 14-18.
- . Photographic Society of India,—Journal, Vol. IV, No. 4.
- Copenhagen. K. Nordiske Oldskrift-Selskab,—Aarboger, Raekke II, Bind V, Hefte 4.
- Dresden. Gesellschaft Iris zu Dresden,—Deutsche Entomologische Zeitschrift, Jahr 1890, Zweites Lepidopterologisches Heft, Band III, Heft 2.
- Edinburgh. The Scottish Geographical Society,—Magazine, Vol. VII, No. 1, and Index to Vol. VI.
- Florence. La Società Italiana di Antropologia, Etnologia e Psicologia Comparata,—Archivio per L' Antropologia e la Etnologia, Vol. XX, Fascicolo 3°.
- Havre. Société de Géographie Commerciale du Havre,—Bulletin, Janvier—Février, 1891.
- London. Institution of Mechanical Engineers,—Proceedings, No. 3, 1890.
- . Nature,—Vol. XLIII, Nos. 1116-20.
- . Royal Astronomical Society,—Monthly Notices, Vol. LI, Nos. 1 and 2.

- London. Royal Geographical Society,—Proceedings, Vol. XIII, Nos. 1 and 2.
- . Royal Microscopical Society,—Journal, Part 6, 1890.
- . Royal Society,—Proceedings, Vol. XLVIII, No. 295.
- . Royal Statistical Society,—Journal, Vol. LIII, Part 4.
- . The Academy,—Nos. 985-89.
- . The Athenæum,—Nos. 3308-12.
- Mendon, Illinois. The American Antiquarian and Oriental Journal,—Vol. XIII, No. 2.
- Mexico. Estados Unidos Mexicanos,—Informes y Documentos relativos à Comercio Interior y Exterior Agricultura é Industrias, Nos. 65 and 66.
- Moscow. La Société Impériale des Naturalistes de Moscou,—Bulletin, No. 3, 1890.
- . ————. Meteorologische Beobachtungen, Das Jahr 1890—Erste Hälfte.
- New York. The Journal of Comparative Medicine and Veterinary Archives,—Vol. XII, No. 3.
- Paris. Journal Asiatique,—Tome XVI, No. 3.
- . La Société de Géographie,—Compte Rendu des Séances, Nos. 6-8, 1891.
- . La Société Zoologique de France,—Bulletin, Tome XV, No. 10.
- . ————. Mémoires, Tome III.
- Philadelphia. Museum of American Archæology,—Annual Report, Vol. I, No. 1.
- Rio de Janeiro. Observatorio do Rio de Janeiro,—Revista do Observatorio, Anno VI, No. 2.
- Rome. La Società Degli Spettroscopisti Italiani,—Memorie, Vol. XX, Disp. 2<sup>a</sup>.
- St. Petersburg. Comité Géologique,—Mémoires, Tome IV, No. 2; V, 1; VIII, 2.
- Stettin. Entomologischen Vereine zu Stettin,—Entomologische Zeitung, Jahr LI.
- Sydney. Linnean Society of New South Wales,—Proceedings, Vol. V, Part 4.
- Taiping. Government of Perak,—The Perak Government Gazette, Vol. IV, Nos. 6-8, and Index to Vol. III.
- Toronto. Canadian Institute,—Transactions, Vol. I, Part I.
- Turin. La R. Accademia delle Scienze di Torino,—Atti, Vol. XXV, Disp. 15<sup>a</sup>; XXVI, Disp. 4<sup>a</sup>-5<sup>a</sup>.
- . ————. Memorie, Serie Seconda, Tomo XL.
- . La Osservatorio della Regia Università di Torino,—Osservazioni Meteorologiche, Anno 1890.

Vienna. Der Anthropologischen Gesellschaft in Wien,—Mittheilungen, Band XX, Heft 3 u 4.

———. Der K. K. Géologischen Reichsanstalt,—Verhandlungen, Nrn. 2-4, 1891.

Zagreb. Hrvatskoga Arkeologickoga Druzstva,—Viestnik, Godina XIII, Br. 2.

## BOOKS AND PAMPHLETS,

*presented by the Authors, Translators, &c.*

HAYTER, H. H. Victorian Year-book for 1889-90. Vol. II. 8vo. Melbourne, 1890.

RAY, PRATAPA CHANDRA, C. I. E. The Mahabharata, translated into English Prose, Part LXV, Canti Parva. 8vo. Calcutta, 1891.

SARMA, PANDIT BHIMA SEN. Manavadharma Sástra, Vol. VII, Part 2. 8vo. Allahabad, 1891.

SEN, KAVIRAJ VIYATARATNA. Ashtanga Hridaya, No. 2. 8vo. Calcutta, 1890.

## MISCELLANEOUS PRESENTATIONS.

Annual Report of the Agri-Horticultural Society of Burma for the year 1890 (Read at the General meeting held at the Phayre Museum). 8vo. Rangoon, 1890.

Minutes of an Ordinary General Meeting of the Agri-Horticultural Society of Burma, held at the Phayre Museum, on Monday, the 30th March, 1891. 8vo.

AGRI-HORTICULTURAL SOCIETY OF BURMA.

Catalogue of Ferns in the Herbarium of the Government of India at Saharanpur. Calcutta, 1890.

BOTANICAL GARDEN, SAHARANPUR.

Resolution on the Revenue Administration of the Central Provinces for the year 1889-90, ending 30th September, 1890. Fcp. Nagpur, 1891.

CHIEF COMMISSIONER, CENTRAL PROVINCES.

Botany: Contributions to the Queensland Flora. By F. M. Bailey, F. L. S. (Bulletin, Department of Agriculture, Brisbane, No. 7). 8vo. Brisbane, 1891.

DEPARTMENT OF AGRICULTURE, BRISBANE.

Returns of the Rail and River-Borne Trade of Bengal during the quarter ending the 31st December, 1890. Fcp. Calcutta, 1891.

GOVERNMENT OF BENGAL.

An Account of the Caves at Nadsur and Karsambla. By Henry Consens (Archæological Survey of Western India, No. 12). 4to. Bombay, 1891.

GOVERNMENT OF BOMBAY.

The Indian Antiquary, Vol. XX, Parts 245 and 246. 4to. Bombay, 1891.

The Voyage of François Pyrard of Laval to the East Indies, the Maldives, the Moluccas and Brazil. By Albert Gray and H. C. P. Bell, Vol. II, Part 2. 8vo. London, 1890.

GOVERNMENT OF INDIA, HOME DEPARTMENT.

Report on the Administration of the Madras Presidency, during the year 1889-90. Fcp. Madras, 1890.

GOVERNMENT OF MADRAS.

Report on the Meteorology of India in 1889. By John Eliot, M. A. Fcp. Calcutta, 1891.

METEOROLOGICAL REPORTER TO THE GOVERNMENT OF INDIA.

Tablas Psycrométricas calculadas Para la Altura De México tablas abreviadas generales compiladas por José Zendejas. 8vo. Mexico, 1889.

OBSERVATORIO METEOROLÓGICO-MAGNÉTICO CENTRAL DE MÉXICO.

Twenty-sixth Annual Report of the Sanitary Commissioner with the Government of India, 1889. Fcp. Calcutta, 1891.

SANITARY COMMISSIONER WITH THE GOVERNMENT OF INDIA. \*

Katalog der Vogelsammlung in Museum der Senckenbergischen Naturforschenden Gesellschaft in Frankfurt am main Von Ernst Hartert. 8vo. Frankfurt, 1891.

SENCKENBERGISCHEN NATURFORSCHENDEN GESELLSCHAFT, FRANKFURT.

### PERIODICALS PURCHASED.

Allahabad. North Indian Notes and Queries,—Vol. I, No. 1.

Berlin. Deutsche Litteraturzeitung,—Jahrgang XI, Nrn. 49-52; XII, 1-5.

———. Journal für die reine und angewandte Mathematik,—Band CVII, Heft 3 u 4.

Zeitschrift für Ethnologie,—Heft V, 1890.

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———. Indian Medical Gazette,—Vol. XXVI, No. 4.

Cassel. Botanisches Centralblatt,—Band XLIV, Heft 9-13; XLV, 1-3, und Index, Band XLIV.

Ceylon. The Orientalist,—Vol. IV, Parts 3 and 4.

Geneva. Archives des Sciences Physiques et Naturelles,—Tome XXV, No. 3.

- Göttingen. Der Königl. Gesellschaft der Wissenschaften,—Göttin-  
gische Gelehrte Anzeigen, Nrn. 23-26, 1890; 1, 1891.
- . ————. Nachrichten, Nrn. 13-14, 1890.
- Leeds. The Journal of Conchology,—Vol. VI, No. 8.
- Leipzig. Annalen der Physik und Chemie,—Band XLII, Heft 4.
- . ————. Beiblätter, Band XV, Stück 2 u 3.
- . Literarisches Centralblatt,—Nrn. 50-52, 1890, und Index, 1890.
- Leyden. Internationales Archiv-für Ethnographie,—Band III, Heft 6.
- London. The Annals and Magazine of Natural History,—Vol. VI  
(sixth series), Nos. 37 and 38.
- . The Chemical News,—Vol. LXIII, Nos. 1634-38.
- . The Entomologist,—Vol. XXIV, Nos. 332 and 333.
- . The Entomologist's Monthly Magazine,—Vol. II (2nd series),  
Nos. 320 and 321.
- . The Ibis,—Vol. III (sixth series), No. 9.
- . The Journal of Botany,—Vol. XXIX, Nos. 337-38.
- . The London, Edinburgh and Dublin Philosophical Magazine,  
—Vol. XXXI (5<sup>th</sup> series), Nos. 188 and 189.
- . The Messenger of Mathematics,—Vol. XX, Nos. 6 and 7.
- . The Quarterly Journal of Microscopical Science,—Vol.  
XXXII, Part I.
- . Rhopalocera Exotica,—Part 15.
- New Haven. The American Journal of Science,—Vol. XL (3<sup>rd</sup> Series),  
No. 240; XLI, Nos. 241-42.
- Paris. L' Academie des Sciences,—Comptes Rendus des Séances,—  
Tome CXI, Nos. 22-26; CXII, 1-4, et Tables, Tome CX.
- . Annales de Chimie et de Physique,—Tome XXII (6<sup>me</sup> Série),  
Janvier et Février, 1891.
- . Journal des Savants, Décembre, 1890.
- . Revue Scientifique,—Tome XLVII, Nos. 12-16.
- . Revue Critique d' Histoire et de Litterature,—Tome XXX, Nos.  
49-52; XXXI, 1-4.
- Philadelphia. Manual of Conchology,—Vol. XII, Part 3; Vol. VI (2<sup>nd</sup>  
series), Part 3.

### BOOKS PURCHASED.

- Chakradasta. 4to. Calcutta.
- GRAHAM, WILLIAM. Socialism, new and old, (The International Scien-  
tific series, Vol. LXX). 8vo. London, 1890.
- NAVILLE, EDOUARD. Bubastis, (1887-89). Eighth Memoir of the  
Egypt Exploration Fund, volume for 1889-90. 4to. London, 1891.
- The Zoological Record, Vol. XXVI, 1889. 8vo. London, 1890.

PROCEEDINGS  
OF THE  
ASIATIC SOCIETY OF BENGAL,  
FOR JUNE, 1891.

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The Monthly General Meeting of the Asiatic Society of Bengal was held on Wednesday, the 3rd June, 1891, at 9-15 P. M.

L. DE NICEVILLE, Esq., F. R. S., in the Chair.

The following members were present :—

E. C. Cotes, Esq., T. R. Munro, Esq., J. D. Nimmo, Esq., R. D. Oldham, Esq., W. L. Slater, Esq., Dr. J. H. Tull-Walsh.

Visitor :—Thomas H. Holland, Esq.

The minutes of the last meeting were read and confirmed.

Thirty-three presentations were announced, details of which are given in the Library List appended.

The following gentlemen, duly proposed and seconded at the last meeting of the Society were ballotted for and elected Ordinary Members.

Rev. D. G. Lathom-Browne.

F. A. Shillingford, Esq.

The following gentleman is a candidate for election at the next meeting :—

Thomas H. Holland, Esq., Geological Survey of India, proposed by R. D. Oldham, Esq., seconded by W. L. Slater, Esq.

The SECRETARY reported the death of the following members :—

John Boxwell, Esq., C. S.

C. W. Baumgarten, Esq.

The PRESIDENT announced that Dr. J. H. Tull Walsh had been elected a member of Council in the room of Dr. D. D. Cunningham, resigned, in consequence of proceeding to Europe on furlough.

Mr. W. L. SCLATER exhibited an old breech-loading gun, which was dug up in the Gya district and was presented to the Indian Museum by Mr. F. Field; the gun had been examined by Col. Mortimer, R. A., of the Ordnance Department, Fort William, who pronounces it to be of European manufacture probably dating from the 16th century, and that it was known by the name of Perrier or Paterera.

Mr. E. C. COTES exhibited two insects which are amongst the causes now conspiring to prevent the continuance of the locust plague through another year.

The following papers were read :—

1. *Note on a fiery hot-blast in the district of Khuln'a, on the 12th May, 1891.*—By H. JAMES RAINEY. Communicated by the NATURAL HISTORY SECRETARY.

While my brother, Mr. J. Rudd-Rainey, and I were at dinner on the 12th May last, in the centre room of "Rainey Villa," between the hours of 8 and 9 o'clock, a very cool wind which was blowing into the room through the south door from the south-east direction quite suddenly changed to an absolutely warm blast from the same quarter, and was accompanied by a clearly discernible smell of combustion. So great was the heat, and so strong the smell of burning even within the room, that I immediately left it and went to the south verandah to see if there was any thatched house on fire close to the brick-built building I was in. I found no sign of any conflagration anywhere in the horizon, but the warm blast outside became absolutely fiery in its intensity. I could barely face it, and that only for a minute or so at a time. I may describe the sensation I felt to be similar to that of standing in close proximity to a heated furnace, or near to and windward of a burning expanse of jungle. This fiery hot-blast continued to blow for about the space of a quarter of an hour, and then the wind suddenly veered to the opposite direction, that is, from south-east to south-west, and a cool breeze set in, which was very grateful, indeed. The sky was overcast with clouds, but of no great density, and some stars were visible here and there, though none of the seven bright stars constituting the constellation *Ursa Major*, or even the pole star. There was much display of electricity in the shape of vivid flashes of lightning in different directions, but especially from the south-east quarter.

I regret exceedingly that I omitted to consult the thermometer at the time, to note the degree of the temperature when exposed to the intensely hot blast. From the result of enquiries instituted by me among my tenants and others, the fiery hot blast appears to have extended to a radius of several miles of my residence, which, I may state, is situated in Khulná Proper, on the left bank or east side of the wide river Rupsháhá, on the opposite or west side of which river stands the present Civil Station of Khulná, and within half a mile distance from it.

I have never before this occurrence experienced anywhere in India, or elsewhere, such a strange intensely hot blast, and cannot in any way satisfactorily account for it. As the subject may be of some interest to Meteorologists, perhaps it would be worth while to fully discuss and elucidate it. I may add that, I find from the *Centenary Review* of the Society, that in Jour. As. Soc., B., Vol. XVII, 1848, there appears a paper on this subject from the veteran Meteorologist H. Piddington, entitled "A Notice of a remarkable Hot Wind in the Zillah of Purneah," but owing to the destruction of my Library I am unable to refer to it.

2. *The 'Tsam-chhó-dung' (rtsa-mchhog-grong) of the Lamas, and their very erroneous identification of the site of Buddha's death.*—By L. A. WADDELL, M. B.

The paper will be published in the Journal, Part I.

## LIBRARY.

The following additions have been made to the Library since the meeting held in May last.

## TRANSACTIONS, PROCEEDINGS AND JOURNALS,

*presented by the respective Societies and Editors.*

Bombay. The Indian Antiquary,—Vol. XX, Part 247.

Budapest. A Magyar Tudományos Akadémia,—Ertekezések, Kötet XIV, Szám 11-12; XV, 1-5.

———. ————. Nyelvtudományi Közlemények,—Kötet XXI, Füzet 3-6.

———. La Société Hongroise de Géographie,—Bulletin, Tome XIX, Nos. 3 et 4.



Budapest. Der Ungarischen Akademie der Wissenschaften,—Mathematische und Naturwissenschaftliche Berichte aus Ungarn, Band VII.

———. Ungarische Revue, Heft 4-10, 1889; 1-4, 1890.

Caen. La Société Linnéenne de Normandie,—Bulletin, 4<sup>e</sup> série, Tome IV.

Calcutta. Indian Engineering,—Vol. IX, Nos. 19-22.

———. Photographic Society of India,—Journal, Vol. IV, Nos. 5-6.

Cincinnati. Journal of Comparative Neurology,—Vol. I.

Copenhagen. K. Nordiske Oldskrift-Selskab,—Aarboger, Raekke II, Bind V, Heft 5.

———. La Société Royale des Antiquaires du Nord,—Mémoires, 1890.

Edinburgh. Royal Physical Society,—Proceedings, Vol. X, Part 2.

The Hague. Koninklijk Instituut voor de Taal,- Land-en Volkenkunde van Nederlandsch-Indië,—Bijdragen tot de Taal- Land-en Volkenkunde van Nederlandsch-Indië, Deel VI, 5<sup>e</sup> Volgr, Aflevering 2.

Havre. Société de Géographie Commerciale du Havre,—Bulletin, Mars-Avril, 1891.

Heidelberg. Historisch-Philosophischen Vereine zu Heidelberg,—Neue Heidelberger Jahrbücher, Jahrgang I, Heft I.

Jassy. Societăţile Ştiinţifice Şi Literare din Iaşi,—Arhiva, An II, No. 7.

London. Geological Society,—Quarterly Journal, Vol. XLVII, Part 2.

———. Institution of Electrical Engineers,—Journal, Vol. XX, No. 92.

———. Nature,—Vol. XLIII, Nos. 1121-24.

———. Royal Society,—Proceedings, Vol. XLIX, No. 297.

———. The Academy, Nos. 990-93.

———. The Athenæum,—Nos. 3313-16.

Manchester. Manchester Literary and Philosophical Society,—Memoirs and Proceedings Vol. IV (4th series), No. 3.

Mexico. La Sociedad Científica "Antonio Alzate,"—Memorias y Revista, Tome IV, Nos. 5-6.

New York. Journal of Comparative Medicine and Veterinary Archives,—Vol. XII, No. 4.

Paris. La Société de Géographie,—Compte Rendu des Séances, Nos. 9-10, 1891.

Pisa. La Società Toscana di Scienze Naturali,—Atti (Processi Verbali), 18th Gennaio et 8 Marzo, 1891.

Rio de Janeiro. Observatorio do Rio de Janeiro,—Revista do Observatorio, Anno VI, No. 3.

- Rome. La Società Degli Spettroscopisti Italiani,—*Memorie*, Vol. XX, Disp 2<sup>a</sup>
- St. Petersburg. La Société Impériale Russe de Géographie,—*Proceedings*, Tome XXVI, No. 5 ; XXVII, 1-2.
- Stettin. Entomologischen Vereine zu Stettin,—*Entomologische Zeitung*, Vols. XXXIX-XLVIII.
- Sydney. Royal Society of New South Wales,—*Journal and Proceedings*, Vol. XXIV, Part 2.
- Tōkyō. Asiatic Society of Japan,—*Transactions*, Vol. XIX, Part I.
- Taiping. Perak Government,—*Perak Government Gazette*, Vol. IV, Nos. 10-12.
- Turin. La R. Accademia delle Scienze di Torino,—*Atti*, Vol. XXVI, Disp. 6<sup>a</sup>.8<sup>a</sup> et Elenco Degli Accademici Residenti, Nazionali non Residenti, Stranieri e Corrispondenti al 1<sup>a</sup> Marzo, 1891.
- Vienna. Der K. K. Geologischen Reichsanstalt,—*Verhandlungen*, Nrn. 5-7.
- Washington. United States Geological Survey,—*Bulletin*, Nos. 58-61, 63, 64.

### BOOKS AND PAMPHLETS,

*presented by the Authors, Translators, &c.*

- OLDHAM, W. Some Historical and Ethnical Aspects of the Burdwan District. 8vo. Calcutta, 1891.
- OSCHANIN, B. List of the Hemiptera of Moscow and the neighbour provinces. 8vo. Moscow, 1870.
- . Materials for a fauna of the Hemiptera of Turkestan. 8vo.
- . The Hemiptera of the Zerafshan Valley. 4to.
- . The Zoogeographical character of the hemipterous fauna of Turkestan. 8vo. St. Petersburg, 1891.
- WHITNEY, W. D. Böhlingk's Upanishads (Reprinted from American Journal of Philology, Vol. XI, No. 4). 8vo.
- . On Böhlingk's Upanishads (Reprinted from the Proceedings, American Oriental Society, Oct. 1890). 8vo.
- . On the second volume of Eggeling's Translation of the Çatapatha-Brāhmaṇa (Reprinted from the Proceedings, American Oriental Society, Oct. 1888). 8vo.
- . The Roots of the Sanskrit Language (Reprinted from the Transactions of the American Philological Association, 1885).
- . IV.—Translation of the Kāṭha-Upanishad (Reprinted from the Transactions of the American Philological Association, Vol. XXI). 8vo.

### MISCELLANEOUS PRESENTATIONS.

A Revision of the South American Nematognathi or cat-fishes. By Carl H. Eigenmann, Ph. D. and Rosa Smith Eigenmann (Occasional Papers of the California Academy of Sciences, I). 8vo. San Francisco, 1890.

Land Birds of the Pacific District. By Lyman Belding (Occasional Papers of the California Academy of Sciences, II). 8vo. San Francisco, 1890.

CALIFORNIA ACADEMY OF SCIENCES, SAN FRANCISCO.

Report on the Judicial Administration (Civil) of the Central Provinces for the year 1890. Fcp. Nagpur, 1891.

Returns of the Rail-borne Traffic of the Central Provinces during the quarter ending 31st December, 1890. Fcp. Nagpur, 1891.

CHIEF COMMISSIONER, CENTRAL PROVINCES.

Some Historical and Ethnical Aspects of the Burdwan District. By W Oldham. 8vo. Calcutta, 1891.

The Fauna of British India, including Ceylon and Burma. Edited by W. T. Blanford. By Eugene W. Oates. Birds, Vol. II. 8vo. London, 1890.

GOVERNMENT OF BENGAL.

The Indian Antiquary, Vol. XIX, Part 242, December, 1890, Part II. 4to. Bombay, 1891.

GOVERNMENT OF INDIA, HOME DEPARTMENT.

Gazetteer of the Ferozepore District, 1888-89. 8vo. Lahore.

GOVERNMENT OF THE PUNJAB.

Programme of the Marine Survey of India for the season 1891-92. Fcp. 1891.

MARINE SURVEY OF INDIA, POONA.

Tezkereh-i-Evliâ. Le Mémorial des Saints traduit sur le manuscrit ouïgour de la Bibliothèque Nationale par A Pavet de Courteille. Fol. Paris, 1889.

———. Manuscrit Ouïgour de la Bibliothèque Nationale. Fol. Paris, 1890.

FRENCH GOVERNMENT.

A Magyar Határozók. A. M. Tud Akadémiától Lukács Krisztina-féle Jutalommal Kitüntetett Pályamunka. írta Simonyi Zsigmond. 8vo. Budapest, 1890.

A Magyar Tud. Akadémia Kiadásában megjelent Munkák És Folyóiratok betűrendes Czim-és Tartalomjegyzéke. 8vo. Budapest, 1890.

Oszmán-Török Népköltési Gyűjtemény. Második Kötet: Oszmán-Török Népmesék és Népdalok. Dr. Kúnos Ignác. 8vo. Budapest, 1889.

Sexti Pompei Festi de verborum significatu quæ supersunt cum pauli epitome. edidit Aemilius Thewrewk de Ponor. Pars I. 8vo. Budapest, 1889.

MAGYAR TUDOMÁNYOS AKADEMIA, BUDAPEST.

Notes on Indian Rotifers. By H. H. Anderson, B. A. (A Reprint from the Journal of the Asiatic Society of Bengal). 8vo. Calcutta, 1891.

MICROSCOPICAL SOCIETY OF CALCUTTA.

Proceedings of the Trustees of the Newberry Library for the year ending January 5th, 1891. 8vo. Chicago, 1891.

NEWBERRY LIBRARY, CHICAGO.

Mineral Resources of the United States, 1888. By David T. Day. 8vo. Washington, 1890.

Monographs of the United States Geological Survey, Vol. I. Lake Bonneville. By Grove Karl Gilbert. 4to. Washington, 1890.

Ninth Annual Report of the United States Geological Survey to the Secretary of the Interior, 1887-'88. By J. W. Powell. 4to. Washington, 1889.

UNITED STATES GEOLOGICAL SURVEY, WASHINGTON.

The Hindu Law of Adoption. By Gopálchandra Sarkár, Sástrí, M. A., B. L. (Tagore Law Lectures, 1888). 8vo. Calcutta, 1891.

UNIVERSITY OF CALCUTTA.

Norges Gamle Love indtil 1387. 5te Bind, 1ste Hefte. 4to. Christiania, 1890.

UNIVERSITY OF CHRISTIANIA.

Report of the President of Yale University for the year ending December 31st, 1890. 8vo. New Haven, 1891.

YALE UNIVERSITY.

### PERIODICALS PURCHASED.

Allahabad. North Indian Notes and Queries,—Vol. I, No. 2.

Braunschweig. Jahresbericht über die Fortschritte der Chemie und verwandter Theile anderer Wissenschaften,—Hefte II, 1888.

Calcutta. Indian Medical Gazette,—Vol. XXVI, No. 5.

Geneva. Archives des Sciences Physiques et Naturelles,—Tome XXV, No. 4.


Leipzig. *Annalen der Physik und Chemie*,—Band XLIII, Heft 1.

———. ————. *Beiblätter*, Band XV, Stück 4.

London. *The Chemical News*,—Vol. LXIII, Nos. 1639-42.

Paris. *Revue Scientifique*,—Tome XLVII, Nos. 17-20.

Vienna. *Vienna Oriental Journal*,—Vol. V, No. 1.

PROCEEDINGS  
OF THE  
ASIATIC SOCIETY OF BENGAL,  
FOR JULY, 1891.

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The Monthly General Meeting of the Asiatic Society of Bengal was held on Wednesday, the 1st July, 1891, at 9-15 P. M.

J. WOOD-MASON, Esq., Vice-President, in the chair.

The following members were present :—

Dr. A. W. Alcock, Bábú Sarat Chandra Dás, Rev. H. B. Hyde, C. Little, Esq., Bábú Asutosh Mukhopádhyaý, L. de Nicéville, Esq., J. D. Nimmo, Esq., C. R. Wilson, Esq.

The minutes of the last meeting were read and confirmed.

Fifty-one presentations were announced, details of which are given in the Library List appended.

The following gentleman, duly proposed and seconded at the last meeting of the Society, was ballotted for and elected an Ordinary Member :—

Thomas H. Holland, Esq.

The SECRETARY reported the death of the following member :—

Lieut.-Col. Sir O. B. St. John, R. E., K. C. S. I.

The PRESIDENT stated that the votes of the members would now be taken on the proposed transfer of Rs. 50,000 of the Society's Permanent Reserve Fund to Municipal Debentures, reported at the meeting in May last, and appointed Dr. A. W. Alcock and Bábú Asutosh Mukhopádhyaý to be Scrutineers, who reported that there were 80 votes in favour of and 14 votes against the proposed transfer, whereupon the President announced that it had been duly carried.

BABÚ SARAT CHANDRA DÁS read a short note on the first tests of renunciation of the early Buddhists.

The following papers were read :—

1. *Additional Uredineae from the Neighbourhood of Simla.*—By A. BARCLAY, M. B., *Bengal Medical Service.*

The paper will be published in the Journal, Part II.

2. *Troy weights and general currency of ancient Orissa.*—By MAN MOHAN CHAKRAVARTI, M. A., B. L.

The paper will be published in the Journal, Part I.

### LIBRARY.

The following additions have been made to the Library since the meeting held in June last.

### TRANSACTIONS, PROCEEDINGS AND JOURNALS,

*presented by the respective Societies and Editors.*

Angers. La Société d'Etudes Scientifiques d'Angers,—Bulletin, XIX<sup>e</sup> Année.

Baltimore. Johns Hopkins University,—American Chemical Journal, Vol. XII, Nos. 6-8; XIII, 1.

—————. American Journal of Mathematics, Vol. XIII, Nos. 1 and 2.

—————. American Journal of Philology, Vol. XI, Nos. 2 and 3.

—————. Circulars, Vol. X, Nos. 87 and 88.

—————. Studies from the Biological Laboratory, Vol. IV, No. 7.

Berlin. Der Königlich Preussischen Akademie der Wissenschaften zu Berlin,—Sitzungsberichte, XLI-LIII; Inhalt Jahrgang 1890.

Bombay. Bombay Natural History Society,—Journal, Vol. VI, No. 1.  
—————. The Indian Antiquary,—Vol. XX, Parts 248 and 249.

Boston. American Philological Association,—Transactions, Vol. XX.

Calcutta. Geological Survey of India,—Records, Vol. XXIV, Part 2.

—————. Memoirs, Vol. XXIII.

—————. (Palæontologia Indica) Ser. XIII, Vol. IV, Part 2.

—————. Indian Engineering,—Vol. IX, Nos. 23-26.

- Danzig. Der Naturforschenden Gesellschaft in Danzig,—Schriften, Neue Folge. Bandes VI, Hefte 3.
- Frankfurt, a. M. Der Senckenbergischen Naturforschenden Gesellschaft,—Abhandlungen, Band XVI, Heft 2.
- . a. O. Des Naturwissenschaftl Vereins des Reg-Bez Frankfurt,—Monatliche Mittheilungen aus dem Gesamtgebiete der Naturwissenschaften, Jahrgang VIII, Nrn. 4-11.
- Ithaca. Cornell University,—Library Bulletin, Vol. II, No. 15.
- Jassy. Societății Științifice Și Literare din Iași,—Arhiva, An II, No. 8.
- London. Anthropological Institute of Great Britian and Ireland,—Journal, Vol. XX, No. 3.
- . Institution of Electrical Engineers,—Journal, Vol. XX, No. 93,
- . Institution of Mechanical Engineers,—Proceedings, No. 4, 1890.
- . Nature,—Vol. XLIV, Nos. 1125-28, and Index to Vol. XLIII.
- . Royal Astronomical Society,—Monthly Notices, Vol. LI, Nos. 3-5.
- . Royal Geographical Society,—Proceedings, Vol. XIII, Nos. 3 and 4.
- . Royal Institution of Great Britain,—Proceedings, Vol. XIII. Part 1.
- . Royal Microscopical Society,—Journal, Parts 1 and 2, 1891.
- . Royal Society,—Proceedings, Vol. XLIX, Nos. 296 and 298.
- . Royal Statistical Society,—Journal, Vol. LIV, Part 1.
- . The Academy,—Nos. 994-97.
- . The Athenæum,—Nos. 3317-20.
- Lyon. La Société D'Anthropologie de Lyon,—Bulletin, Tome IX.
- Moscow. La Société Impériale des Naturalistes de Moscou,—Bulletin, No. 4, 1890.
- . Meteorologische Beobachtungen, Das Jahr, 1890,—Zweite Hälfte.
- New Haven. Connecticut Academy of Arts and Sciences,—Transactions, Vol. VIII, Part 1.
- New York. American Museum of Natural History,—Bulletin, Vol. III, No. 1.
- . Journal of Comparative Medicine and Veterinary Archives,—Vol. XII, No. 5.
- Paris. Journal Asiatique,—Tome XVI, No. 2; XVII, 1.
- . L'Académie Nationale des Sciences, Belles-Lettres et arts de Bordeaux,—Actes, 3<sup>e</sup> série—XLIX et L<sup>e</sup> Années.



- Paris. La Société Académique Indo-Chinoise de France,—Bulletin, 2<sup>e</sup> Série. Tome III.
- . La Société D'Anthropologie de Paris,—Bulletins, Tome I (IV<sup>e</sup> Série) Fasc. 2<sup>e</sup> et 3<sup>e</sup>.
- . ———. Mémoires, Tome IV (2<sup>e</sup> Série), Fasc. 2<sup>e</sup>.
- . La Société de Géographie,—Bulletin, Tome XII (IV<sup>e</sup> Série), No. 1.
- . ———. Compte Rendu des Séances, No. 11, 1891.
- . La Société Zoologique de France,—Bulletin, Tome XVI, Nos. 1 et 2.
- . Muséum Guimet,—Revue de l'Histoire des Religions, Tome XXII, Nos. 1-3.
- Philadelphia. Academy of Natural Sciences of Philadelphia,—Proceedings, Parts 2 and 3, 1890.
- Rio de Janeiro. Museu Nacional,—Archivos, Vol. VII.
- . Observatorio do Rio de Janeiro,—Revista do Observatorio, Anno VI, No. 4.
- Rome. La Società Degli Spettroscopisti Italiani,—Memorie, Vol. XX, Disp. 4<sup>a</sup>.
- St. Petersburg. Comité Géologique,—Bulletins, Tome IX, Nos. 7 et 8.
- . ———. Mémoires, Vol. V, No. 5; X, 1.
- . La Société Impériale Russe de Géographie,—Proceedings, Tome XXVII, No. 3.
- Taiping. Perak Government,—Perak Government Gazette, Vol. IV, Nos. 13-16.
- Tokyo. Imperial University of Japan,—Journal of the College of Science, Vol. IV, Part 1.
- Vienna. Der Anthropologischen Gesellschaft in Wien,—Mittheilungen, Band XXI, Heft 1, und General-Register, Band XI-XX.
- . Der K. K. Géologischen Reichsanstalt,—Abhandlungen, Band XIV.
- . Der Kaiserlichen Akademie der Wissenschaften,—Archiv für Österreichische Geschichte, Band LXXV, Hälfte 1 und 2.
- . ———. Denkschriften (Mathematisch-Naturwissenschaftliche classe), Band LVI.
- . ———. (Philosophisch-Historische classe), Band XXXVII.
- . ———. Fontes Rerum Austriacarum, Band XLV, Hälfte 1.
- . ———. Sitzungsberichte (Mathematisch Naturwissenschaftliche classe), Abtheilung I, Band XCVIII, Heft 4-10, XCIX, 1-3; II A, XCVIII, 4-10, XCIX, 1-3; II B, XCVIII, 4-10, XCIX, 1-3; III, XCVIII, 5-10, XCIX, 1-3.

Vienna. Der Kaiserlichen Akademie der Wissenschaften,—Sitzungsberichte (Philosophisch-Historische classe), Band CXIX-CXXI.

Washington. Smithsonian Institution,—Annual Report, 1888.

## BOOKS AND PAMPHLETS,

*presented by the Authors, Translators, &c.*

BLOOMFIELD, MAURICE. On Adaptation of Suffixes in Congeneric Classes of Substantives (Reprinted from the American Journal of Philology, Vol. XII, No. 45). 8vo. Baltimore, 1891.

CONSTABLE, A. The Kennet Ciburium (Reprinted with additions from Scottish National Memorials). Fol. Edinburgh, 1890.

ELLIS, J. B., and EVERHART, BENJAMIN M. New North American Fungi (Reprinted from the Proceedings of the Academy of Natural Sciences of Philadelphia, July 29th, 1890). 8vo.

———. New Species of Fungi from various localities (Reprinted from the Proceedings of the Academy of Natural Sciences of Philadelphia, Part I, 1891). 8vo.

———. New Species of Montana Fungi (Reprinted from the Botanical Gazette, February, 1891). 8vo.

———. Notes on a Species of *Coprinus* from Montana (Reprinted from the Microscope, Vol. X, No. 5). 8vo. Trenton, 1890.

HORN, PAUL. Die Denkwürdigkeiten des Schâh Tahmâsp I von. Persien. (Zeitschrift der Deutschen Morgenländischen Gesellschaft, Band XLIV, Nr. 4). 8vo.

———. Die Denkwürdigkeiten Schâh Tahmâsp's des Ersten von Persien (1515—1576). 8vo Strassburg, 1891.

NETTO, LADISLÁU. Le Muséum National de Rio-de-Janeiro et son influence sur les Sciences Naturelles au Brésil. 8vo. Paris, 1889.

RÂÿ, PRATÂPA CHANDRA, C. I. E. The Mahabharata, translated into English prose, Part LXVI. Çanti Parva. 8vo. Calcutta, 1891.

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PROCEEDINGS  
OF THE  
ASIATIC SOCIETY OF BENGAL,  
FOR AUGUST, 1891.

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The Monthly General Meeting of the Asiatic Society of Bengal was held on Wednesday, the 5th August, 1891, at 9-15 p. m.

THE HON'BLE SIR A. W. CROFT, K. O. I. E., President, in the chair.

The following members were present :—

Dr. A. F. R. Hoernle, Rev. H. B. Hyde, W. H. Jobbins, Esq., Dr. W. King, C. Little, Esq., Bábú Asutosh Mukhopádhyaý, L. de Nicéville, Esq., W. L. Slater, Esq., Pandit Hara Prasád Shástri, C. H. Tawney, Esq., Dr. J. H. Tull Walsh, C. R. Wilson, Esq.

Visitor :—Dr. E. Thurston.

The minutes of the last meeting were read and confirmed.

Forty-two presentations were announced, details of which are given in the Library List appended.

The following gentlemen are candidates for election at the next meeting :—

H. C. Mallik, Esq., Calcutta, proposed by Hon. Sir A. W. Croft, seconded by C. Little, Esq.

Dr. E. H. Brown, Civil Surgeon, Puri, proposed by Bábú Man Mohan Chakravarti, seconded by C. Little, Esq.

Dr. M. A. Stein, Principal, Government College, Lahore, proposed by Dr. A. F. R. Hoernle, seconded by C. Little, Esq.

Diego Ernst, Esq., Delhi, proposed by W. L. Slater, Esq., seconded by Dr. W. King.

Dr. Edgar Thurston, Superintendent, Government Central Museum, Madras, proposed by Dr. W. King, seconded by W. L. Slater, Esq.



The SECRETARY reported the death of the following member :—

Rájá Rájendralála Mitra, LL. D., C. I. E.

The PRESIDENT observed :—It is with great regret that I have to make to the Society the formal announcement of the death of one of its most distinguished members, Rájá Rájendralála Mitra. It is not only within the walls of this Society, or even in Bengal, that his loss will be deplored ; it will be felt throughout Europe ; for wherever learning is cultivated, there the name of Rájendralála Mitra is held in honour. His connection with this Society, extending over nearly half a century, was of a quite exceptional character. Entering it, when a young man, as Assistant-Secretary and Librarian, his commanding abilities and untiring industry soon brought him into prominence ; and while we may congratulate ourselves that it was this Society which first gave him the opportunity of satisfying his inexhaustible craving for knowledge, we must gratefully admit that he has amply repaid the debt by the contributions that he has made to Oriental learning, and by the lustre that his name and attainments have shed upon the Society, of which he was one of the most distinguished in the long roll of Presidents.

I will only add that the Council at its last meeting passed the following Resolution :—

“The Council desire to place on record their deep sense of the  
“very great loss the Asiatic Society of Bengal and Oriental Learning  
“have sustained by the death of their former President and Vice-  
“President, Rájá Rájendralála Mitra, and to express their great  
“sorrow at the sad event that has deprived the Society of a most  
“learned and distinguished supporter who has been closely connected  
“with it for nearly half a century, and the Council of a much esteem-  
“ed Colleague.”

The PRESIDENT read the following letter :—

No. 357.

To

THE SECRETARY, ASIATIC SOCIETY, BENGAL.

Home Department. }  
Book. }

*Simla, the 26th June, 1891.*

Sir,

I am directed to state for the information of the Bengal Asiatic Society that Lieutenant-Colonel H. H. Godwin-Austen's work on the land and fresh water Mollusca of India and surrounding countries, a

copy of which has already been forwarded for the use of the Society, was intended to be supplementary to Messrs. Theobald and Hanley's "*Conchologia Indica*," but it is unfortunately unfinished, though complete in itself so far as it goes. In connection with the publication of the "*Fauna of British India*" it has been suggested to the Government of India that, on completion of the present series of seven volumes relating to the *Vertebrata*, the work should be extended so as to comprise the *Invertebrata* as well, and this proposal has been recommended for the favourable consideration of the Secretary of State. As, however, the following up of Colonel Godwin-Austen's work must be a necessary preliminary to any adequate treatment of the subject in the proposed extension of the *Fauna Indica* series, I am to enquire whether any person connected with the Asiatic Society would be willing to continue the researches so ably begun by Colonel Godwin-Austen.

I have &c.,

(Signed) P. G. MELITUS,

*Under-Secy. to the Govt. of India.*

The PHILOLOGICAL SECRETARY read the following reports on finds of Treasure Trove Coins:—

I. Report on 232 Silver coins forwarded by the Deputy Commissioner of Jabalpur, with his No. 1941, dated 6th May, 1891.

The Deputy Commissioner's letter states that they were found buried, but no particulars as to where, when and how they were discovered are given.

All the coins are Moghuls, and belong to the following emperors of Delhi:—

|                                                           |           |
|-----------------------------------------------------------|-----------|
| 1, AKBAR, 963—1014 A. H. = 1556—1605 A. D.                |           |
| round <i>jal jalāl</i> rupees of the Aḥmadábád mint ..... | 2         |
| 2, JAHÁNGÍR, 1014—1037 A. H. = 1605—1627 A. D.            |           |
| round rupees of several varieties .....                   | 6         |
| 3, SHÁH JAHÁN, 1037—1068 A. H. = 1627—1658 A. D.          |           |
| a, type: square areas, 4 varieties .....                  | = 55      |
| b, type: round areas, 4 varieties .....                   | = 8       |
| c, type: lettered surfaces, 4 varieties .....             | = 12   75 |
| 4, AURANGZÍB, 1068—1118 A. H. = 1658—1707 A. D.           |           |
| a, type: <i>badr munir</i> , 3 varieties .....            | = 126     |
| b, type: <i>mīhr munir</i> , .....                        | 17        |
| c, type: <i>Abul Muzaḥḥar</i> .....                       | 4         |
| d, type: reversed writing .....                           | 2   149   |
| Total ...                                                 | 232       |

The earliest of these coins is dated in the 40th year of Akbar, that is 1596 A. D., the latest is dated in the 30th year of Aurangzib, that is, 1687 A. D. They cover a period of nearly one century, and they must have been buried not long after the year 1687 A. D., in the place where they were dug up.

Among them there are several of considerable interest, especially among the rupees of Aurangzib; thus those of the *badr munir* type. Rupees of this description are not common; they appear to have been only minted in Akbarnagar, Zafarabad and Multan. I am not certain as to the identity of the two first-named places; but Akbarnagar is said to be an old name of Rajmahal. In the present collection there are 17 rupees of this description; 15 of these are of the Akbarnagar mint, of the following years 1071, 1072, 1079, 1082, 1084, 1090, 1093, 1095; both years, that of the Hijrah as well as that of the reign, are shown on the reverse; while the usual practice is, to give the Hijrah on the obverse, but the reign on the reverse. One rupee is of the Zafarabad and one of the Multan mint; both of the same year, viz., Hijrah 1080 on the obverse, and regnal 12 on the reverse. Another peculiar rupee of Aurangzib is that which gives the obverse legend: *Muhammad Aurangzib Bahadur 'Alamgir Badshah Ghazi* or *Muhammad Muhiu-d-din Abu-l-Muzaffar Bahadur 'Alamgir Badshah Ghazi*. Of this description there are four coins. Their mint is illegible; their dates are 1069 *ahad*, 1080-3, 1081-3, 1082-4; the years are disposed, as usual, on the obverse and reverse. Another curiosity are two rupees of Aurangzib which bear the usual legends but in inversed characters, so that they may be read if held against a mirror. The characters are rather crude; the mint is not legible, the year of the reign is either 22 or 27, that of the Hijrah is 109\*. Coins of this description, might of course, be struck from ordinary rupees.

II. Report on 116 old coins forwarded by the Deputy Commissioner of Sagar, with his No. 1708, dated the 14th May, 1891.

These coins are stated to have been found in the village waste of Raigawan, in the Rhurai Tahsil of the Sagar District, by boys who were tending cattle.

They are all silver coins and consist of 63 Pathan, 50 Gujarati and 3 other coins: distributed as follows:

I, Pathan Coins (Rupees):

of SHER SHAH, 947—952 A. H. = 1540—1545 A. D.

- |                                                                                                    |    |
|----------------------------------------------------------------------------------------------------|----|
| a, type: square areas, single-lined, as in <i>Chronicles</i> , No. 351, two varieties .....        | 22 |
| b, type: square areas, single-lined as in <i>Chronicles</i> , Nos. 344, 352, three varieties ..... | 24 |

|                                                                                                                          |   |
|--------------------------------------------------------------------------------------------------------------------------|---|
| <i>c</i> , type : square areas, single-lined, new variety .....                                                          | 2 |
| <i>d</i> , type : square areas, double-lined, as in <i>Chronicles</i> ,<br>346, 354, two varieties.....                  | 6 |
| <i>e</i> , type : round areas, single-lined, as in <i>Indian Anti-</i><br><i>quary</i> , vol. XVII, pl. I, fig. 9 .....  | 5 |
| <i>f</i> , type : round areas, single-lined, as in <i>Indian Anti-</i><br><i>quary</i> , vol. XVII, pl. I, fig. 8.....   | 2 |
| <i>g</i> , type : round areas, single-lined, as in <i>Indian Anti-</i><br><i>quary</i> , vol. XVII, pl. I, fig. 10 ..... | 2 |

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Total coins of Sher Sháh ... 63

## II, Gujaráti Coins:


|                                                                                                                                                                                         |   |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| 1, MAHMÚD SHÁH I, 863—917 A. H. = 1458—1511 A. D.                                                                                                                                       |   |
| <i>a</i> , type : indented square area on obv., like <i>J. A. S. B.</i> ,<br>vol. LVIII, pl. I, fig. VIII. Mint Shádiyábád, date<br>913; weight $\frac{1}{2}$ tolá .....                | 1 |
| <i>b</i> , type : square area on obv., unpublished, not in<br>British Museum Catalogue. Mint: Shahr .....,<br>date 903, weight $\frac{1}{2}$ tolá .....                                 | 1 |
| <i>c</i> , type : similar to above, but lighter, weight about $\frac{1}{3}$<br>tolá; unpublished, not in British Museum Cata-<br>logue. Mint: <i>Shahr 'Aẓam Muṣṭafábád</i> ; date 906. | 1 |
| <i>d</i> , type : like <i>a</i> , but lighter; weight like <i>c</i> ; not in<br>British Museum Catalogue. Mint illegible; date<br>867.....                                              | 1 |
| <i>e</i> , type : like <i>a</i> , but lighter, weight like <i>d</i> , but smaller<br>and thicker size; not published, nor in British<br>Museum Catalogue; dates 902, 903 .....          | 2 |

---

Total coins of Maḥmúd ... 6

|                                                                                                                                                                                |    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| 2, MUẒAFFAR SHÁH II, son of preceding, 917—932 A. H.<br>= 1511—1525 A. D.                                                                                                      |    |
| <i>a</i> , type : lettered surfaces, like British Museum Cata-<br>logue, No. 425, weight about $\frac{2}{3}$ tolá, date 930 on<br>reverse .....                                | 1  |
| <i>b</i> , type : lettered surfaces; similar to <i>a</i> , unpublished;<br>not in British Museum Catalogue; weight about<br>$\frac{2}{3}$ tolá; 926 <sup>bis</sup> , 929 ..... | 3  |
| <i>c</i> , type : indented square area on reverse; published<br>in British Museum Catalogue, No. 440; no mint<br>or date visible, weight about $\frac{1}{2}$ tolá each .....   | 12 |
| <i>d</i> , type : double indented square area on reverse; un-                                                                                                                  |    |

|                                                                                                                                                                                                                                                                  |    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|
| published, not in British Museum Catalogue,<br>* dates 920 <sup>bis</sup> , 921 <sup>bis</sup> , 922 <sup>6</sup> , 923 <sup>2</sup> , 924 <sup>1</sup> , 926 <sup>2</sup> , 928 <sup>1</sup> ,<br>932 <sup>1</sup> , about $\frac{1}{2}$ tolá each, total ..... | 17 |
| e, type: indented square area within circle on re-<br>verse; date 926, mint <i>Shahr</i> ....., unpublished,<br>not in British Museum Catalogue.....                                                                                                             | 1  |
| f, type: like d, but lighter, about $\frac{1}{4}$ tolá, dates 926,<br>930, 92* .....                                                                                                                                                                             | 4  |
| g, type: like c, but lighter about $\frac{1}{4}$ tolá; mint and<br>date not visible.....                                                                                                                                                                         | 6  |
| Total coins of Muzaffar ...                                                                                                                                                                                                                                      | 44 |
| Grand total of Gujarátí coins...                                                                                                                                                                                                                                 | 50 |

|                                                                                                                                                                                                                                                                                                  |   |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| III. Other coins; of uncertain attribution; very small;<br>less than $\frac{1}{4}$ tolá each; marked on one side with <br>j' and a trisula or trident, which used to be the em-<br>blem of the Sagar mint ..... | 3 |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|

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Grand total of all coins ... 116

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This is a most interesting find. Most of the Gujarátí coins and some of Sher Sháh are new, hitherto not known or at least not published. Most of them, as shown by their catalogue, are not represented in the British Museum Collection.

III. Report on six old silver coins forwarded by the Deputy Commissioner of Jalandar, with his No. 752, dated 12th June, 1891.

The Deputy Commissioner's letter merely states that 39 coins were found buried in the Jalandar district, but no particulars are given as to the exact place and time of discovery.

Those 39 coins are stated to have comprised 4 of Aurangzib, 2 of Farrukh Siyar and 33 of Muhammad Sháh, all three Moghul emperors of Delhi, reigning between 1658 and 1748 A. D., a period of nearly one century. The coins accordingly were probably buried during the troubles of Nádir Sháh's invasion of India.

From among the 39 coins, 6 only were sent down to be examined and reported on, two of each kind. These were found to be of very common descriptions.

IV. Report on fifty old rupees forwarded by the Deputy Commissioner of Wardha, with his No. 3424, dated 3rd July 1891.

These old rupees are stated by the Deputy Commissioner to have been found buried in an earthen pot, when the foundations were being dug for additions to a small temple of Bálají at Waigaon, a village about ten miles south of Wardha. They are supposed to have been buried by the family of the Bhagat or attendant of that temple, because they were found on the site of a former dwelling-house of theirs, and the family have been Bhagats of the temple for three generations.

The find comprises rupees of the following emperors of Delhi :

|                                   |           |
|-----------------------------------|-----------|
| 1, SHÁH JEHÁN, A. D. 1627—1658    | 5 rupees. |
| 2, AURANGZÍB, A. D. 1658—1707     | 19 "      |
| 3, FARRUKH SIYAR, A. D. 1712—1719 | 3 "       |
| 4, MUHAMMAD SHÁH, A. D. 1719—1748 | 21 "      |
| 5, 'ALAMGÍR ZÁNÍ, A. D. 1754—1769 | 2 "       |

Total ... 50 Rupees.

All these rupees are in a very bad condition and belong to very common descriptions. Possibly a few of the coins ascribed to Muḥammad Sháh may belong to his successor Aḥmad Sháh (A. D. 1748—1754).

The PHILOLOGICAL SECRETARY exhibited eight gold Gupta coins, belonging to Mr. Rivett-Carnac, and remarked as follows :

"Four of these coins belong to Chandra Gupta II, who reigned from about 395—415 A. D., and four to Kumára Gupta I, who reigned from 415—454 A. D. (see in J. A. S. B., Vol. LVIII, Pt. I, my synchronistic table). Of the coins of Chandra Gupta one is of the *Couch* type (see Smith's Catalogue in the *Journal R. A. S.*, p. 76). This is an extremely rare type. Hitherto only one specimen was known. The present (second) specimen affords some new information. The king's up-raised right hand is not empty, but holds a flower (lotus?), and he sits on a high-backed couch. The legend on the left margin (facing the king) is fully legible and reads देव श्री महाराजाधिराज श्री च, and on the right margin (behind the king) it continues all round the rim, but unfortunately only चक्र is just legible. Thus much was already known; it is *deva S'ri Mahárájádhirája S'ri Chandra Gupta*. The vowel-marks of the long á were probably originally on the coin, and are merely worn away. The (hitherto illegible) characters below the couch are quite distinct and read clearly चक्रवर्ती *rúpa-kṛtī*, i. e., 'he who is clever in dramatic composition.' Above the *akshara* च *pa*, but quite detached from it, there is a small horizontal stroke. The meaning of it I do not know; but it is certainly not any vowel-mark; perhaps it owes its presence to a mere fault in the die. The word *rúpa* may mean either 'sculp-

ture, figure' or 'dramatic composition;' and the compound *rūpa-kṛtī* may mean either 'who is clever in the making of figures' or 'who is clever in the making of dramas or dramatic representations.' I prefer taking the word in the latter sense, because it is not quite uncommon to hear of kings in ancient India being dramatic authors. The well-known drama, called the *Mṛcchahhakaṭikā*, is ascribed by tradition to a king Śūdraka. Still more to the point is the discovery by Prof. F. Kielhorn, of a drama composed by the Chauhan king Vighraharā-jadeva of Śākambhari (see *Indian Antiquary*, Vol. XX, p. 201), in the middle of the 12th century A. D. This drama was inscribed on a stone slab, which has been found in Ajmīr; and Prof. Kielhorn rightly says with reference to it, that 'actual and undoubted proof is here afforded to us of the fact that powerful Hindú rulers of the past were eager to compete with Kālidāsa and Bhavabhūti for poetical fame.' It appears to me, that this coin of Chandra Gupta's shows that this king also laid claim to the honour of dramatic authorship. The reverse is rather poorly preserved; the legend is श्री विक्रम श्री *Vikrama* with double *kk*.

"Another of the Chandra Gupta coins is of the *Lion Trampler* type. This is also a rare type; there are four varieties, of which the second and third varieties are known only by one specimen each; the first and fourth are not quite so rare. The present specimen belongs to the fourth variety. It is a poor specimen, the legends being almost entirely wanting on both sides.

The third coin of Chandra Gupta is of the *Horseman to Right* type. Its reverse is good, but the legend on the obverse is nearly gone; only *parama-bhaga* ..... *ndra-guptaḥ* being preserved; the legend commences in front of the king's head, running all round the rim and terminating behind his head.

The fourth coin of Chandra Gupta belongs to the *Horseman to Left* type. Of this type there exist two varieties; one, which is not very rare, has the reverse legend *ajita vikrama*; the present coin belongs to this variety. The obverse legend is entirely gone.

Of the Kumāra Gupta coins one belongs to the *Archer* type and the Variety II, A. It is not an uncommon variety, and the present coin is a rather poor specimen, the legends on both sides being almost entirely gone.

The three other coins of Kumāra Gupta are all of the *Horseman to Right* type. Of this type there exist three varieties, of which the first and third are not uncommon, while the second is very rare. Among the three coins there is one of the second variety, showing on the reverse a goddess sitting on a wicker stool, stooping forward, with







her left hand resting on her hip, and holding an open flower in her right. The obverse legend on this variety has never been read; nor does the present specimen afford much help; only *प्रथिवी नमाम्य* *pr̥thivīlām-para* can be read, apparently about one-third of the entire legend. The two other specimens belong to the third variety which shows the same goddess feeding a peacock with her right, while in her left she holds a lotus-flower. One is a rather poor specimen, with nearly the entire legend lost. The other is much better, and apparently preserves the entire legend, in the following, somewhat curious form: *क्षिति* (read *क्षिति*) *पतिरजितो विजयकुमार गु* *Kshiti-patir ajito vi[jaya-Kumāra] Gu*. The portion enclosed in brackets is mutilated, the rest is perfect. The legend commences with *kshi* on the right hand margin, between the king's head and the horse's neck; it closes with *gu* close behind the king's head. There is no space for the complementary *aksharas* *ः* *ptaḥ*. The form of the legend, therefore, is here shorter than usual.

The PHILOLOGICAL SECRETARY exhibited a Buddhist chaitya of bronze, which was purchased by the Society from its finder through Bábú Tarakhnáth Roy. It is said to have been found together with two inscribed copper-plates several years ago at the village of Ashraf-pur, near Raipur, in the Dacca district, during the process of levelling a mound in the neighbourhood of a tank. One of the copper-plate inscriptions was published by Dr. Mitra, as long ago as 1885 (see *Proceedings* of that year, for March, p. 49). The other copper-plate was purchased by the Society last year from the finder, a villager named Mír Khán. It was also being prepared for publication by Dr. Mitra, and will now be published by myself. Both inscriptions are dated in the same year, *viz.*, *Samvat* 13; the first in *Vaiśákha* 13, the other in *Paushadha* 25. There is nothing in the inscriptions to determine to which era the date 13 should be referred. From the shape of the characters, which is that of the so-called Kuṭila, the inscriptions may be referred to the eighth or ninth century or perhaps somewhat later. The Newár era of Nepál, which commences with 880 A. D., might fit the date; and it would then be equivalent to 893 A. D. But this may be left to further determination, hereafter, when the copper-plates are published. It may be noted, however, that the date was wrongly read by Dr. Mitra in 1885, as being *Samvat* 713. What he read as the numeral 7, is really the final consonant *t* of *Samvat*; and the two other symbols are not those for 1 and 3, but for 10 and 3. The symbols are those of the older numeral system of notation, which had separate signs for the units, tens, hundreds, etc., and which was still employed in India for epigraphical purposes as late as the eighth and ninth centuries of the

Christian era. In Nepal it held its ground for a much longer time. The chaitya having been found with the inscriptions is of undoubtedly the same age, and may date from the ninth century. The mound in which the objects were found would seem to mark the ruined site of a Buddhist's shrine. The chaitya is of bronze, and fairly well preserved; it is made of three stories, built up in pyramidal form, consisting of a high, slightly sloping, square basemont, on which rises a tall cylindrical dome, surmounted by a small square turret with projecting roof. See Plate III. The whole was originally surmounted by two, or perhaps three, umbrellas of which, however, only the lowermost is preserved. Under this umbrella, attached to its pole, is a minute plate inscribed with the Buddhist creed in (now) illegible characters. The four sides of the turret are adorned with four sitting figures of Buddha, projecting from the walls. Three are in the witnessing and one in the meditating posture. Four other figures are placed round the body of the dome, exactly below the upper figures, within ornamental niches, which are connected with one another with bands and festoons. The basement bears, on each of its four sides, three sitting figures (twelve in all); each triad consisting of one male between two female figures. The figures round the dome probably represent Bodhisattvas, while the basement figures appear to be Buddhist devas and saktis. The chaitya, therefore, already represents Buddhism in the much depraved Tantrik form, in which it was current in Bengal at the time of its extinction.

MR. C. H. TAWNEY called attention to Plate XXXIII, fig. 4, in General Cunningham's *Bharhut Sculptures*, and said, I think that this scene represents the story contained in the 407th Jātaka, Fausböhl's edition.

It is called the *Mahākapijātaka*, and the story is as follows:

When Brahmadata was king in Benares, the Bodhisattva was at the head of a troop of eighty thousand monkeys. They used to eat the fruits of a mango-tree on the banks of the Ganges. The Bodhisattva took particular care to prevent the fruits of one branch that overhung the Ganges, from falling into the river. In spite of all his precautions one fruit came into the hands of king Brahmadata, when enjoying himself in the Ganges, and he asked the foresters whence it came. They at once said, that the tree that bore this fruit was to be found in the neighbourhood of the Himālayas. The king took them as guides, and with a large retinue, ascended the river in rafts, and after disembarking, and eating to his fill of the fruits of the tree, he lay down to rest.

In the night the eighty thousand monkeys came and began to

plunder the tree. The king woke up and saw them. He then stationed archers all round the tree with their arrows ready on the string, and told them to let none of the monkeys escape, asserting his intention of breakfasting the next morning off monkey-flesh and mangoes. The monkeys, being terrified, came trembling to the Bodhisattva their king. He told them not to be afraid, as he would save their lives. He then sprang across the Ganges, alighted in a thicket, picked out a creeper, made it smooth, and fastened it to his body. Unfortunately he miscalculated the length of the creeper, not allowing for the portion, that was to pass round his own body. He then made one end of the creeper fast to a tree, and sprang towards the other bank, where he had left his subjects terrified on the mango-tree. Owing to his having miscalculated the required length, he had to catch hold of the mango-tree with his arms. In this position he made a sign to the monkeys to pass over his body, and escape to the other bank. They did so, but Devadatta, who was among the monkeys, and saw an opportunity of injuring his enemy, climbed up to a lofty branch, and sprang with all his force on to the Bodhisattva's back, thus injuring his heart, which is said to have been "split."

It appears to me that so much of the story is clearly represented in the Bharhut Sculpture. The king of the monkeys is seen holding on to the mango-tree. A monkey has just crossed his body, and is crossing the creeper. Another is descending the tree on the other bank. Between the two trees flows a river containing three fish and one tortoise. Many monkeys are seen on the mango-tree. At the top of the mango-tree is seen a monkey with his paws so placed as to make his spring on to the back of the monkey-king as harmful as possible.

This monkey I take to be Devadatta, and I think a comparison of his face with the faces of the other monkeys will show that the artist has succeeded in imparting a particularly malignant expression to it.

The latter part of the story is not clearly represented in the picture. According to the Jātaka, the king, after taking most tender care of the monkey-king, made him lie down, and sitting himself on a low seat, listened to his sermon on the duty of a good king. But in General Cunningham's photograph, the monkey-king appears to be sitting on a stool a little higher than that of the human king. I take it, that the artist has followed a slightly different version of the tale. The king appears to be expressing his admiration for the courage and self-devotion of the monkey-king. The rectangular object brought by two men is supposed by General Cunningham to be a mat. It may be intended for the monkey-king to lie down on. As soon as the monkey-king had finished his sermon on the duty of a king, he died of the blow given by the monkey Devadatta.

After his death the king sent for his ministers, and had a pyre prepared containing a hundred cart-loads of wood. He ordered his wives to attend the funeral clad in red garments, with dishevelled hair, and torches in their hands. After the body was buried, he preserved the skull, and had it worshipped for seven days by the people of Benares on his return. He then erected a *chaitya* over it, and honoured it with perfumes and garlands as long as he lived.

The following papers were read:—

1. *Lamaic Rosaries: their Kinds and Uses.*—By L. A. WADDELL, M. B.

2. *On the date of the Bower Manuscript exhibited at the meetings of November 1890, and April 1891.*—By DR. A. F. RUDOLF HOERNLE.

The papers will be published in the Journal, Part I.

3. *Notes on the Snakes in the Collection of the Indian Museum with descriptions of several new species.*—By W. L. SCLATER, M. A., Deputy Superintendent, Indian Museum.

The paper will be published in the Journal, Part II.

## LIBRARY.

The following additions have been made to the Library since the meeting held in July last.

## TRANSACTIONS, PROCEEDINGS AND JOURNALS,

*presented by the respective Societies and Editors.*

Baltimore. Johns Hopkins University,—Circulars, Vol. X, Nos. 89-91.

Batavia. Bataviaasch Genootschap van Kunsten en Wetenschappen,—Notulen, Deel XXIX Aflevering 1.

———. ————. Tijdschrift voor Indische Taal-, Land-en Volkenkunde, Deel XXXIV, Aflevering 5.

Bordeaux. La Société Linnéenne de Bordeaux,—Actes, Vol. XLIII.

Calcutta. Indian Engineering,—Vol. X, Nos. 1-5.

———. Photographic Society of India,—Journal, Vol. IV, No. 7.

Copenhagen. K. Nordiske Oldskrift-Selskab,—Aarboger, Raekke II, Bind VI, Hefte 1-2.

- Danzig. Der Naturforschenden Gesellschaft in Danzig,—Schriften, Neue Folge, Bandes VII, Heft 4.
- Dorpat. Der Naturforscher-Gesellschaft bei der Universität Dörpat,—Sitzungsberichte, Band IX, Heft 2.
- Havre. Société de Géographie Commerciale du Havre,—Bulletin, Mai-Juin, 1891.
- Jassy. Societății Științifice Și Literare din Iași,—Arhiva, Anno II, No. 9.
- Leipzig. Der Deutschen Morgenländischen Gesellschaft,—Zeitschrift, Band XLV, Heft 1.
- London. Institution of Electrical Engineers,—Journal, Vol. XX, No. 94.
- . Nature,—Vol. XLIV, Nos. 1129-33.
- . The Academy,—Nos. 998-1002.
- . The Athenæum,—Nos. 3321-25.
- . Zoological Society of London,—Proceedings, Part 1, 1891.
- . Transactions, Vol. XIII, Parts 1 and 2.
- Mendon, Illinois. The American Antiquarian and Oriental Journal, Vol. XIII, No. 2.
- New York. The Journal of Comparative Medicine and Veterinary Archives,—Vol. XII, No. 6.
- Paris. La Société de Géographie,—Compte Rendu des Séances, Nos. 13-15, 1891.
- Pisa. La Società Toscana di Scienze Naturali,—Atti, Memorie, Tome XI.
- Rio de Janeiro. Observatorio do Rio de Janeiro,—Revista do Observatorio, Anno VI, No. 5.
- Rome. La Società Degli Spettroscopisti Italiani,—Memorie, Vol. XX, No. 5.
- Taiping. Perak Government,—Perak Government Gazette, Vol. IV, Nos. 17-19.
- Turin. La R. Accademia delle Scienze di Torino,—Atti, Vol. XXVI, Nos. 9-11.

## BOOKS AND PAMPHLETS,

*presented by the Authors, Translators, &c.*

- BÜHLER, G. The new Sanskrit MS. from Mingai (Reprinted from Vienna Oriental Journal, Vol. V, No. 2.) 8vo. Vienna, 1891.
- KIELHORN, F. Die Vikrama Aera. 8vo.
- NURSINGROW, A. V., F. R. A. S., F. R. G. S. Results of Meteorological

- Observations at G. V. Juggarow Observatory, Daba Gardens, Vizagapatam, for 1890, with an introduction. 8vo. Calcutta, 1891.
- SARMA, PANDIT BHIMA SEN. Manavadharma Sástra, Vol. VII, Part 4. 8vo. Allahabad, 1891.
- WOOD-MASON, J., and ALCOCK, A. On the Uterine Villiform Papillæ of *Pteroplataea Micrura*, and their Relation to the Embryo, being Natural History Notes from H. M. Indian Marine Survey Steamer 'Investigator,' Commander R. F. Hoskyn, R. N. commanding. No. 22. (Reprinted from the Proceedings of the Royal Society, Vol. XLIX). 8vo. London.

### MISCELLANEOUS PRESENTATIONS.

Mélanges Asiatiques tirés du Bulletin de L'Académie Impériale des Sciences de St. Pétersbourg, Tome X, Livraison 1. 4to. St. Pétersbourg, 1890.

L'ACADEMIE IMPERIALE DES SCIENCES DE ST. PETERSBOURG.

Proceedings of an Ordinary General Meeting of the Agricultural Society of Burma, held at the Phayre Museum, on Monday, the 29th June, 1891. 8vo.

AGRICULTURAL SOCIETY OF BURMA.

The Bústán of Shaikh Muşlihu-d-dín Sa'adí. 8vo. London, 1891.

MESSRS. W. H. ALLEN AND CO., LONDON.

Nederlandsch-Indisch Plakaatboek, 1602—1811, door Mr. J. A. Van der Chijs, Deel VIII, 1765—1775. 8vo. Batavia, 1891.

BATAVIAASCH GENOOTSCHAP VAN KUNSTEN EN WETENSCHAPPEN.

The Thirty-third Annual Report of the Trade and Commerce of Chicago for the year ending December 31st, 1890. 8vo. Chicago, 1891.

BOARD OF TRADE, CHICAGO.

Annual Report of the Sanitary Commissioner of the Central Provinces for the year 1890. Fcp. Nagpur, 1891.

Notes of the Annual Statements of the Government Charitable Dispensaries in the Central Provinces for the year 1890. Fcp. Nagpur, 1891.

Report on the Jails of the Central Provinces for the year 1890. Fcp. Nagpur, 1891.

Report on the Judicial Administration (Criminal) of the Central Provinces for the year 1890. Fcp. Nagpur, 1891.

Report on the Lunatic Asylums of the Central Provinces for the year 1890. Fcp. Nagpur, 1891.

Report on the Police Administration of the Central Provinces for the year 1890. Fcp. Nagpur, 1891.

Resolution on the Management by Government of Private Estates in

the Central Provinces for the year ending the 30th September, 1890.

\* Fcp. Nagpur, 1891.

CHIEF COMMISSIONER, CENTRAL PROVINCES.

Contributions to Canadian Palæontology, Vol. I, Part 3. By J. F.

\* Whitcoates. 8vo. Montreal, 1891.

GEOLOGICAL AND NATURAL HISTORY SURVEY OF CANADA.

Annual Report on Inland Emigration for the year 1890. Fcp. Calcutta, 1891.

Annual Report on the Police Administration of the Town of Calcutta and its Suburbs for the year 1890. Fcp. Calcutta, 1891.

Reports on the Alipore and Hazaribagh Reformatory Schools for the year 1890. Fcp. Calcutta, 1891.

GOVERNMENT OF BENGAL.

Copies of Despatches from the Secretary of State in Council to the Government of India, dated the 13th day of May and the 3rd day of July, 1890, relating to "the Amendment of the Indian Factory Act, 1879." Fcp. London, 1891.

Report of the Indian Factory Commission, appointed in September, 1890, under the Orders of His Excellency the Governor-General in Council, with Proceedings and Appendices. Fcp. London, 1891.

GOVERNMENT OF INDIA, HOME DEPARTMENT.

Dr. E. Hultzsch's progress report of the Archæological Survey, Madras from October, 1890 to March, 1891. Fcp. Madras, 1891.

GOVERNMENT OF MADRAS.

Final Report on the Revision of Settlement of the Sirsá District in the Punjab, 1879-83, and maps to accompany the Report. 8vo. Lahore, 1891.

Report on the Sanitary Administration of the Punjab for the year 1890. Fcp. Lahore, 1891.

GOVERNMENT OF THE PUNJAB.

Report of the Commissioners appointed to inquire into the origin, nature, etc. of Indian Cattle Plagues, with Appendices, 1871. Fcp. Calcutta, 1891.

Reports on the Settlement Operations in the District of Azamgarh: as also in Parganas Sikandarpur and Bhadaon. Fcp. Allahabad, 1881.

DR. A. F. RUDOLF HOERNLE.

\* Catalogue of Mammalia in the Indian Museum, Calcutta, Part II. By W. L. Sclater. 8vo. Calcutta, 1891.

Indian Museum Notes, Vol. I, No. 5. Containing Title Page, List of Contents, and Index to Vol. I.

INDIAN MUSEUM.



Administration Report of the Marine Survey of India for the official year 1890-91. Fcp. Bombay, 1891.

MARINE SURVEY OF INDIA.

Memorandum on the snowfall in the mountain districts bordering Northern India and the abnormal features of the weather in India during the past five months, with a forecast of the probable character of the south-west monsoon rains of 1891. By John Eliot. Fcp. Simla, 1891.

METEOROLOGICAL REPORTER TO THE GOVERNMENT OF INDIA.

Bulletin of the Microscopical Society of Calcutta, Vol. I, No. 7.

MICROSCOPICAL SOCIETY OF CALCUTTA.

Esboço de uma Climatologia Do Brazil por H. Morize. 8vo. Rio de Janeiro, 1891.

OBSERVATORIO DO RIO DE JANEIRO.

Annual Report of the Provincial Museum Committee, Lucknow, for 1890-91. Fcp. 1891.

PROVINCIAL MUSEUM, LUCKNOW.

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———. ———. Article II. Index to the Literature of Thermodynamics. By Alfred Tuckerman, Ph. D. 8vo. Washington, 1890.

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SMITHSONIAN INSTITUTION, WASHINGTON.

Account of the Operations of the Great Trigonometrical Survey of India. Vol. XIV. 4to. Dehra Dun, 1890.

SURVEYOR GENERAL OF INDIA.

Obituary Record of Graduates of Yale University, deceased during the academical year ending in June, 1891. 8vo.

Report of the Yale University for the year 1890-91.

YALE UNIVERSITY.

PERIODICALS PURCHASED,

Allahabad. North Indian Notes and Queries,—Vol. I, No. 4.

Braunschweig. Jahresbericht über die Fortschritte der Chemie und verwandter Theile anderer Wissenschaften, Heft III, 1888.

Calcutta. Calcutta Review,—Vol. XCIII, No. 185.

———. Indian Medical Gazette,—Vol. XXVI, No. 7.

Geneva. Archives des Sciences Physiques et Naturelles,—Tome XXV,  
No. 6.

Leipzig. Annalen der Physik und Chemie,—Band XLIII, Heft 3.

———. ————. Beiblätter, Band XV, Stück 6.

London. The Chemical News,—Vols. LXIII, Nos. 1646-48; LXIV,  
1649-51.

Paris. Revue Scientifique,—Tomes XLVII, Nos. 25 et 26; XLVIII,  
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PROCEEDINGS  
OF THE  
ASIATIC SOCIETY OF BENGAL,  
FOR NOVEMBER, 1891.

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The Monthly General Meeting of the Asiatic Society of Bengal was held on Wednesday, the 4th November, 1891, at 9 P. M.

DR. W. KING, B. A., in the chair.

The following members were present :—

Bábu Sarat Chandra Dás, The Most Rev. Dr. Paul Goethals, Rev. H. B. Hyde, C. Little, Esq., Kumár Rameswár Maliáh, T. R. Munro, Esq., J. D. Nimmo, Esq., W. L. Sclater, Esq., C. H. Tawney, Esq., C. R. Wilson, Esq.

Visitor :—Dr. W. W. Sheppard.

The minutes of the last meeting were read and confirmed.

One Hundred and Thirty-seven presentations were announced, details of which are given in the Library List appended.

The SECRETARY reported that the following gentlemen had been elected Ordinary Members of the Society during the recess, in accordance with Rule 7 :—

H. C. Mallik, Esq.

Dr. E. H. Brown.

Dr. M. A. Stein.

Diego Ernst, Esq.

Edgar Thurston, Esq.

The following gentleman is a candidate for election at the next meeting :—

A. Mervyn Smith, Esq., C. E., F. S. A., proposed by W. H. Miles, Esq., seconded by Dr. W. King.

The following gentleman has expressed a wish to withdraw from the Society :—

W. H. Lee, Esq., C. S.

The SECRETARY reported the death of the following member :—

Surgeon-Major A. Barclay, I. M. S.

The PRESIDENT read the following obituary notice :—

Surgeon-Major A. Barclay, an active member of this Society, died of typhoid fever at Simla on the 2nd August. He was only 39 years of age. His loss is deeply regretted by his own service and it is intended to perpetuate his memory by means of some permanent monument. In a public letter the present Surgeon General with the Government of India says of Dr. Barclay, who was his Secretary :—" No one can know as I do how much the service is indebted to Barclay. On all occasions, when questions affecting its welfare came up for discussion, his first thought was for the preservation of the honor and dignity of it as a body, and for the safe-guarding of the interests of individual members. In this, for a man ordinarily kindly, gentle and dispassionate, he was fearless in giving expression to his views and never hesitated to put them forward in forcible language." This is high but well deserved praise. To us Dr. Barclay's work as a member of this Society is of the greatest interest. His general knowledge was wide, but his leisure time was specially devoted to the study of parasitic fungi of the order *Uredineæ*. Upon subjects connected with these fungi Dr. Barclay published eight papers in the *Scientific Memoirs* by officers of the Indian Medical Service ; seven papers in the *Journal of the Asiatic Society of Bengal* and others in the *Annals of Botany*, *The Journal of Botany*, *The Transactions of the Linnean Society* and in the *Journal of the Bombay Natural History Society*. He was a good draughtsman and photo-micrographer and most of his papers were accompanied by excellent plates. It will be seen therefore that Dr. Barclay was an untiring worker and apart from the purely scientific interest attached to his writings he will be remembered as one who has done well by shewing the public the nature of fungi destructive to crops and by suggesting remedies. It was intended to send Dr. Barclay to the South of India to investigate the *Coffee disease*, an undertaking which would have been full of interest to him and to the scientific world and of benefit to the coffee planters. His last scientific work, before his death, was connected with the Leprosy Commission, whose report will soon appear and we may rest assured that his contributions to the work will be found marked by that energy and honesty which was so characteristic of the man.

The PHILOLOGICAL SECRETARY read the following reports on finds of Treasure Trove Coins :—

I. Report on 213 old Rupees forwarded by the Deputy Commissioner of Multán, with his No. 550, dated the 13th August, 1890.

The Deputy Commissioner's letter states that at the end of August 1889 a vessel containing 400 rupees of some ancient mintage was found by two men in a field. Of these 187 rupees were melted down by the finders, before proceedings could be taken under the Treasure Trove Act. The balance of 213 rupees was forwarded to me for identification and report. Their value is stated to be Rs. 217 according to the current coinage.

Of these 213 rupees, 178 are Mughal, and 33 Affghan, one is a Persian and one a Sikh coin. They are mostly in fair condition.

They are classified as follows :

I. MUGHAL RUPEES.

1, <i>Aurangzib</i> : 1068—1118 A. H. = A. D. 1658—1707.	
Usual type ; mints : Lahor, Etáwah, Multán, Tattah, Súrat, Ajmír, Sháhjahánábád, .....	22
2, <i>Bahádur Sháh 'Álam</i> , 1118—1124 A. H. = 1707—1712 A. D. ....	11
3, <i>Farrokh Siyar</i> , 1124—1131 A. H. = 1712—1719 A. D. Usual type : .....	11
4, <i>Rafiu-d-darjút</i> , 1131 A. H. = 1719 A. D. ....	2
5, <i>Sháh Jahán II.</i> , 1131 A. H. = 1719 A. D. ....	1
6, <i>Muhammad Sháh</i> , 1131—1161 A. H. = 1719—1748 A. D. Type I : "Şáhib Airán " ; mint : Sháhjahánábád....	63
Type II : "Bádsháh Gházi " ; several varieties : ...	51
7, <i>Ahmad Sháh Bahádur</i> , 1161—1167 A. H. = 1748—1754 A. D. Usual type .....	14
8, ' <i>Álamgír Zúni</i> , 1167—1173 A. H. = 1754—1769 A. D.	3

Total Mughals ... 178

II. AFFGHÁN RUPEES : (Durrání Dynasty) :

1, <i>Ahmad Sháh</i> , 1160—1182 A. H. = 1747—1772 A. D. as in Jour., As. Beng., vol. LIV, p. 67 .....	18
2, <i>Tímúr Sháh</i> , 1187—1207 A. H. = 1773—1783 A. D. as in Numism. Chronicle, vol. VIII, p. 336, .....	15

Total of Durranis ... 33

## III. Persian coin :

*Nádir Sháh*, 1148—1160 A. H. = 1736—1747 A. D.

As in Numism. Chron., vol. II, p. 322. Mint:

Sháhjahánábád, date 1152 ..... 1

## IV. Sikh Rupee :

*Ranjit Singh*, 1799—1839 A. D.

As in Journal A. S. B., vol. L, p. 85. Mint: Amritsar,

date 1869 Saṃvat ..... 1

Grand total of all coins ... 213

II. Report on 142 old sicca coins forwarded by the Deputy Collector of Chittagong, with his No.  $\frac{2194}{xix-56}$  G, dated 27th January, 1891.

The Offg. Collector of Chittagong in his report on these coins to the Commissioner of the Chittagong division states they were found somewhere in the village of 'Joogkhalla,' in Thannah 'Fattickaurry.' The date of the finding could not be ascertained.

All the coins are rupees of English mintage, such as were coined between 1793 and 1818, under the Regulations of 1793, in Calcutta and the subordinate mints of the Bengal Presidency. They are known as "19th san" Rupees, nominally from the Murshidábád, but really from the Calcutta mint, recognisable by their oblique milling.

III. Report on 15 old silver coins, forwarded by the Deputy Commissioner of Rawalpindi, with his No. 913G, dated 1st June 1891.

The coins are stated by the Deputy Commissioner to have been found in the Fateh Jang Tahsil; no further particulars are given.

They comprise 5 Mughal, 9 Durrání and one Sikh rupees, and are classified as follows :

## I, Mughal Rupees :—

1, FARROKH SIYAR, ordinary type, ..... 1

2, MUHAMMAD SHÁH, *Saḥib Qirán* type, ..... 4

Total Mughal ... 5

## II, Durrání Rupees :—

1, TAIMÚR SHÁH, 1187—1207 A. H. = 1773—1793 A. D.

a, ordinary type of Mughal rupee, mint *Atak* ..... 1

b, Kábulí type; mint *Kábul* and *Hirát* (Num. Chr. VIII, 3) ..... 2

2, ZAMÁN SHÁH, 1207—1216 A. H. = 1793—1801.

a, Kábulí type, one variety, as in Num. Chron. VIII, No. 59, mint Pesháwar ..... 1

b, Kábulí type, another variety, as in Num. Chron. VIII, No. 70, mint Pesháwar, date 1211 ..... 2

3, SHUJĀ'U-L-MULK, 1216—1258 A. H. = 1801—1842 A. D.	
Kābulī type, mint Peshāwar .....	1
4, MAHMŪD SHĀH, 1216—1245 A. H. = 1801—1829 A. D.	
a, Kābulī type, one variety, as in Num. Chron. VIII, No. 82, mint Aḥmadshāhī, date 1217 .....	1
b, Kābulī type, another variety, as in Num. Chron. VIII, No. 85, mint Dāru-s-Saltānat Hīrāt, 1218...	1

Total Durrānīs ... 9

### III, Sikh Rupee :

RANJIT SINGH, mint Amritsar, Samvat 1868 .....	1	1
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Grand total Rupees ... 15

IV. Report on 29 old silver coins, forwarded by the Offg. Collector of Pubna, with his No. 372, dated 15th June 1891, and No. 561, dated 28th July 1891.

The exact locality of the find of these coins is not stated in the Collector's letter; they are supposed to have been found sometime in February or March 1891. Some more coins appear to have been found, but broken and melted into bars by the finders. Their value is stated to be about Rs. 32-8.

The coins include 4 of Paṭhān Sultāns of Delhi and 24 of the so-called Independent Sultāns of Bengal. They may be classified as follows :—

#### I, Paṭhān Rupees :

1, SHER SHĀH, 947—952 A. H. = 1540—1545 A. D.	
Type : square areas, date 946 .....	1
2, ISLĀM SHĀH, 952—960 A. H. = 1545—1552 A. D.	
Type a : circular areas : a new variety of No. 361a in <i>Thomas' Chronicles</i> ; date 952 to be read from within ; no mint .....	1
Type b : square areas, dates 956, 960, two inferior specimens .....	2

Total Paṭhān ... 4

#### II, Independent Sultān's of Bengal :

1, 'ALĀU-D-DĪN ḤUSAIN SHĀH, 899—925 A. H. = 1493— 1518.	
a, Type, as in Brit. Mus. Cat., Nos. 123—130 ...	3
b, Type, as in Marsden DCCLXXIX .....	3
c, Type, unpublished .....	1



2, NAṢIRU-D-DÍN NAṢRAT SHÁH, 925—939 A. H. = 1518—1532 A. D.	
<i>a</i> , Type, as in Brit. Mus. Cat., No. 137 .....	1
<i>b</i> , Type, as in Brit. Mus. Cat., Nos. 139, date 925	8
3, GHIYÁṢU-D-DÍN MAHMÚD SHÁH III, 933—944 A. H. = 1532—1537 A. D.	
Type as in Brit. Mus. Cat., No. 147 .....	3
4, GHIYÁṢU-D-DÍN BAHÁDUR SHÁH, 962—968 A. H. = 1554—1560 A. D., type: square areas, as in Brit. Mus. Cat., No. 155 .....	4
5, GHIYÁṢU-D-DÍN JALÁL SHÁH, 968—971 A. H. = 1560—1563 A. D., as in Brit. Mus. Cat., No. 153, dated 970	1
Total Bengal	24
III, Mughal Rupee:	
1, SHÁH JAḤÁN, 1037—1068 A. H. = 1627—1658 A. D., type: two square areas, ordinary, date 1047, 10, mint illegible .....	1
Grand total coins ...	29

V. Report on 792 old copper coins forwarded by the Offg. Collector of Monghyr, with his No. 721R, dated the 1st August 1891.

The coins are stated to have been found in January 1889, buried in the garden of Hazari Shahú of Mouza Bargazar, Parganá Salimábád, outpost Lakhi Sarai.

A very large number of the coins are not in a sufficiently good state of preservation to be fully identified; but they all belong to the coinage of the Sultáns of Jaunpur, and to the so-called "second size" of their copper coins, as described in the Catalogue of the British Museum on the *Coins of the Muhammadan States of India*, p. 89. Of these copper coins, there are two types: one with simple lettered surfaces, the other with a circular area on the reverse. The former is a very common type; the latter is rather rare. The coins, under review, all belong to the common type. Four of them together weigh  $1\frac{1}{2}$  tolá, and six of them are equal to one anna, or each of them is equal to 2 pico (1 pice =  $\frac{1}{16}$  anna).

Those specimens, that I have been able to identify, are thus distributed:

1, IBRÁHÍM SHÁH, called <i>Sharqí</i> , A. H. 803—844 = A. D. 1400—1440; like B. M. Cat., Nos. 238,	86
2, MAHMÚD SHÁH, bin Ibráhím, A. H. 844—861 = A. D. 1440—1456; like B. M. Cat., No. 273,	98

3, MUHAMMAD SHĀH, bin Maḥmūd, A. H. 861—863 = A. D.	
1456—1458; like B. M. Cat., No. 301,	... 37
4, ḤUSAIN SHĀH, bin Maḥmūd, A. H. 863—900 = A. D.	
1458—1500; like B. M. Cat. No. 327,	... 59
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	Total ... 280
Unserviceable coins :—	512
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	Grand total ... 792

MR. C. H. TAWNEY read the following note :—

I do not think attention has ever been drawn to the fact that in Indian tales the royal dignity is often described as bestowed by lot. At any rate this appears to have frequently taken place, when a king died without leaving male issue. In the *Kathā Sarit Sāgara*, Taranga 65, we read that it was the custom in a certain country, when the king died, to turn loose an elephant, and any man that he took up with his trunk, and placed on his back, was anointed king.

In the *Kathā Kośa*, a collection of edifying tales written in Jaina Sanskrit, an excellent manuscript of which has been kindly lent to me by the Principal of the Sanskrit College, a slightly different method is described. We read in the story of Devapāla, the second story in this work, that the king of a certain city died of cholera, and left no male issue. "As there was no son to succeed him, the ministers appointed an elephant, and fastened to its temples a pitcher of water, and let it go. It found the servant, named Devapāla, asleep under a *pīpal*-tree, and emptied the pitcher on his head. They bestowed on him the kingdom."

In this way the servant was rewarded for showing devotion to a stone image of the Jina, that he found in a river.

In the story of Amaradatta and Mitrānanda, the 20th story in the *Kathā Kośa*, we find the following account given of the election of a king at Pātāliputra :

"Now it happened that the king of that city died in the course of the night, without leaving issue. Then the ministers had recourse to the five ordeals, (*diryini*). The mighty elephant came into the garden outside the city. There the elephant sprinkled prince Amaradatta and put him on his back. Then the horse neighed. The two chowries fanned the prince. An umbrella was held over his head. A divine voice was heard in the air, 'Long live king Amaradatta.'"

It happens that in this particular case the person chosen was by birth a prince, and was roaming about *incognito*. But this is merely a piece of folk-lore justice.

The above extract may be supported by another from the tale of Virāṅgada and Sumitra, which is an episode in the tale of Ratnaśikha, the 69th in the Kathā Kośa. It runs as follows :—

“The king of the city of Mahāsāla died without a son. Then the barons had recourse to the five ordeals of the elephant, the horse, and so on. The elephant came into the city park trumpeting. Then he sprinkled the prince, named Virāṅgada, with the water of inauguration, and taking him up in his trunk, placed him on his forehead, (*kumbha-sthala*). All the barons, and the chief ministers, and the other ministers, and the crowd with them bowed before the king, and exclaimed ‘Long live the king!’”

The five ordeals are described even more clearly in a passage in the story of Mūladeva, the eighth in Professor Jacobi’s “*Erzählungen in Mahārāshtrī*,” or “*Tales in Mahārāshtrī Prākṛit*.”

The story is said by the editor to be taken from Devendra’s Commentary on the Uttarādhyayana Sūtra. The passage may be thus translated :—

“At this juncture the king of the city died without leaving a son. They then had recourse to the five ordeals, (or instruments of selection, Prākṛit *divīni*). These roamed about in the city, and went outside it. They came to Mūladeva. He was found sleeping in the shade of the *champaka*-tree. On seeing him the elephant trumpeted, and the horse neighed : he was sprinkled by the pitcher and fanned by the chowries, and the umbrella stood over him.”

It is remarkable in this connexion that Darius, son of Hystaspes, is said to have been chosen king of the Persians owing to the neighing of his horse, it having been agreed by the seven conspirators who destroyed the usurper Smerdis, that the one of them, whose horse neighed first, should become king.\*

It seems probable that this story points to a Persian custom resembling that which prevailed in India.

Indeed it appears that even in the latter country it was the custom occasionally, to dispense with the elephant, and to rely upon the horse as the sole instrument of selection.

This is proved by the following passage taken from another story in Dr. Jacobi’s collection, the story of the Pratyeka Buddha Karakaṇḍu :

“The three fled and reached Kāchanapura. There the king died without male issue. A horse was let loose, and came near Karakaṇḍu,

\* Herodotus (Book III, cc. 83—87) tells us that the success of Darius was due to an artifice of his groom ; but at the same time he asserts that the neighing of the horse was accompanied by thunder and lightning from a clear sky. It is possible that artifice was not always absent in similar cases in India.

as he was sleeping outside the city. The horse circumambulated him and stood still. The citizens observed with awe that he possessed the auspicious marks of a king. They raised a shout of triumph and beat drums of rejoicing. He rose up yawning."

It is worthy of note that according to Herodotus, the seven conspirators agreed to decide the question of succession, by observing whose horse neighed first in the suburb, (*προάστειον*) at sunrise. This constitutes a further similarity between the Indian custom, and the custom which I suppose to have existed in Persia. It seems natural that both horses and elephants should be employed in India in choosing kings, as Strabo tells us (Book XV, c. 41) that "no private person is allowed to keep a horse or an elephant. The possession of one or the other is a royal privilege, and persons are appointed to take care of them."

The passages which I have quoted are taken with one exception from Jaina works. But I find a trace of a similar custom in the Darimukhajātaka, (Fausböll, Vol. III, p. 238). In this Jātaka we read that on the seventh day after the death of the king of Benares without male issue, the *purohita* sent out the *phussaratho*. The word *phussaratho* is explained in Childers's Pali Dictionary as meaning simply "chariot." In Sanskrit the word *pushyaratha* is said to mean a pleasure-chariot, as opposed to a war-chariot. We are told in the Pali text that the custom of the *phussaratho* will be explained in the Mahājanajātaka, but I have not been able to find this Jātaka in the three volumes published by Fausböll. The *phussaratho* left the city of Benares surrounded by an army of elephants, cavalry, chariots and infantry, and with the beating of many drums, arrived at the gate of the king's garden, in which the two heroes of the tale, the Bodhisattva and his friend Darimukha were sitting. Darimukha knew, as soon as he heard the sound of the drums, that his friend the Bodhisattva would shortly be elevated to the royal dignity, and as he preferred the life of a wandering religious mendicant, he immediately left the garden, for fear that his friend might appoint him commander-in-chief. The *purohita* entered the garden, and finding the Bodhisattva sitting on the auspicious stone, and seeing that he possessed the auspicious marks which entitled him to govern even the four *drūpas*, and being satisfied with certain indications of his character, informed him that the crown had fallen to his lot. The Bodhisattva, when he had satisfied himself that the late king had died without male issue, accepted the throne, and his coronation (or rather sprinkling) took place then and there. I own that in this last case the appeal to divination seems to have degenerated into a mere formality.

Of course the collections of Indian tales, from which I have made extracts, contain incidents and plots common to the folk-lore of many

countries. But I think that the institution of the five ordeals must have been a custom widely recognised in this country, as otherwise no narrator would have introduced such a minute account of it into tales intended for Indian readers.

No doubt scholars whose acquaintance with ancient Indian literature is wider than my own, will be able to throw fresh light on the subject.

The following papers were read :—

1. *Natural History notes from H. M's. Indian Marine Survey Steamer "Investigator,"* Commander R. F. HOSKYN, R. N., commanding. No. 25. *The Vegetation of the Coco Group.*—By D. PRAIN.

[Abstract.]

The Cocos consist of three islands extending over a space of 15 miles, lying 30—45 miles north of Landfall, the northmost island of the Andaman main group. These islands were visited by the writer when the "Investigator" was surveying there in December 1889 and in November 1890. All three islands were visited and a collection of plants made. This paper describes the collection. It consists of three parts ;

1. A sketch of the vegetation of the group with an account of the relationship this bears to the physiographical features of the group.

2. A list of the species collected ; with notes on their habitat, distribution, and, occasionally, their systematic position.

3. An enquiry into the nature, distribution and probable origin of the Flora.

The plants collected comprise 358 species distributed among 268 genera and 95 natural orders, 297 species being Phanerogams and 61 Cryptogams—a proportion of 4·85 to 1.

Among the Phanerogams 238 are Dicots and 59 are Monocots—a proportion of 4 to 1.

Among the Dicots the *Polypetalæ* equal the rest of the groups in number, a somewhat unusual circumstance. The most extensively represented natural order is *Leguminosæ* (34 sp.) ; after a long interval come *Euphorbiaceæ* and *Graminæ* (15 sp. each) ; *Convolvulaceæ* (14 sp.) ; *Rubiaceæ*, (13 sp.) ; *Urticaceæ*, (11 sp.) ; *Cyperaceæ*, (10 sp.). No other natural order, except *Filices*, (10 sp.), has more than 8 sp. and 24 of the natural orders have but one species each.

The non-vascular species (Lower cryptogams—*Algæ*, *Fungi*, and *Lichens*) number 46 ; of the remaining 312 sp., 234 are erect and 78 are climbers—a proportion of 3 to 1.

Of erect species 142 are woody, 92 are herbaceous ; among climbers 35 are woody, 43 are herbaceous—a proportion in the first case of 3 to 2 and in the second of 4 to 5. Of the climbing species 20, or 25%, are armed.

As regards distribution:—70 are cosmopolitan in the tropics, 10 more are present in the tropics of both hemispheres, but are scarcely cosmopolitan; 49 are widely distributed in the eastern hemisphere; 41 are confined to Asia and Australasia; and 188 are confined to South-eastern Asia.

As regards more local distribution: 252 species extend to India, or Ceylon, or both; 153 species extend to Australia; 140 species to China.

The islands lie so to speak intermediate between the Indo-Chinese and Malayan phytogeographic districts and the following is the occurrence of species within these:—confined, so far as is yet known, to the Coco Group, 13; occurring in the Andamans, 324 (90%); occurring in Malaya, 275 (76%); in Tenasserim, 259 (72%); in Indo-China, 256 (71%). We conclude therefore that the group forms phytogeographically part of the Andamans and that in its flora a Malayan influence predominates slightly over the Indo-Chinese.

Examined with a view to ascertaining more precisely the probable origin of the flora we find that of species which may possibly have been introduced (not thereby necessarily implying that they are *not* indigenous but simply pointing out that it is not *essential*, in order to account for their presence, to postulate a connection of the islands with neighbouring land) the list contains 288, as opposed to 70 that seem to require the conception some former land-connection in order to explain their occurrence. The proportion of *Migrant* (possibly introduced) species to *Remanent* (certainly indigenous) species is therefore 4 to 1. The remanent species indicate that the most recent former land-connection may have been with Indo-China.

Of the introduced species 33 are "civilized" plants, cultivated plants or weeds, introduced voluntarily or involuntarily by man; 94 have been perhaps introduced by birds (assisted perhaps slightly by frugivorous bats); 60 have been introduced by winds; 101 by the sea.

Of the sea-introduced species 21 are marine plants, 80 are littoral species; they appear to have come wholly from Malayan seas. The wind-introduced species indicate that it is the north-east (not the south-west) monsoon which is the more important factor. This might be expected since the latter blows over a wide expanse of ocean to these islands, while the former, though not so strong, blows steadily for some months each year from the direction of the nearest land. The bird-introduced species are of two kinds:—Those attached externally to the bodies of birds and those carried in the crops of birds. Of the first kind there are two sub-groups: *a.* those attached immediately to their bodies by reason of the fruits being viscous or being provided with barbs or

hooklets to their seeds or fruits; of this kind there are possibly 9 species: *b.* by means of other substances, *e. g.*, spiders-webs, or mud, as in the case of swimming and wading birds; of this kind there are 16.

Those carried in the crops of birds are also of two different kind: *a.* those introduced by frugivorous birds (perhaps also partly by bats), where the fruits are eaten on account of their pulp and the seeds, though swallowed, are voided uninjured; of this kind there are 55. This mode of introduction is an every-day result of the mode of life of the creatures concerned: *b.* those introduced by grain- and seed-eating birds, where introduction can only happen when the bird that brings the seed or grain falls a victim, on arrival, to some bird or beast of prey; this may happen in the case of any migrating bird when it arrives fatigued after a lengthened flight, and must also happen to a certain proportion of the birds that are driven, numbed or injured, to the land by storms. Of this kind there are perhaps 14 species.

The paper will be published in full in the Journal, Part II.

2. *List of Diptera of the Oriental region*, Part II,—By MONS. J. M. F. BIGOT. Communicated by THE NATURAL HISTORY SECRETARY.

The paper will be published in the Journal, Part II.

3. *On a symbolical coin of the Wethdli dynasty of Arakan*,—By W. THEOBALD, M. R. A. S. Communicated by DR. W. KING.

4. *Græco-Roman Influence on the Civilization of Ancient India (Second Paper)*,—By VINCENT A. SMITH, M. R. A. S., Bengal Civil Service.

The papers will be published in the Journal, Part I.

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## LIBRARY.

The following additions have been made to the Library since the meeting held in August last.

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*presented by the respective Societies and Editors.*

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PROCEEDINGS  
OF THE  
ASIATIC SOCIETY OF BENGAL,  
FOR DECEMBER, 1891.

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The Monthly General Meeting of the Asiatic Society of Bengal was held on Wednesday, the 2nd December, 1891, at 9 P. M.

J. WOOD-MASON, Esq., Vice-President, in the chair.

The following members were present :—

Bábu Gaurdás Bysack, Hon. Sir A. W. Croft, Bábu Saratchandra Dás, G. C. Dudgeon, Esq., The Most Rev. Dr. Paul Goethals, Dr. A. F. R. Hoernle, T. H. Holland, Esq., Rev. H. B. Hyde, C. Little, Esq., C. J. Lyall, Esq., Kumár Rameswár Maliáh, W. H. Miles, Esq., Bábu Asutosh Mukhopádhyaý, T. R. Munro, Esq., L. de Nicéville, Esq., R. D. Oldham, Esq., Pandit Haraprasád Shástri, C. H. Tawney, Esq., Dr. E. Thurston, Col. J. Waterhouse, C. R. Wilson, Esq.

Visitor :—Rev. Dr. K. S. Macdonald.

The minutes of the last meeting were read and confirmed.

Forty-four presentations were announced, details of which are given in the Library List appended.

The following gentleman duly proposed and seconded at the last meeting of the Society, was ballotted for and elected an Ordinary Member :—

A. Mervyn Smith, Esq., C. E., F. S. A.

The following gentlemen are candidates for election at the next meeting :—

Lieutenant Wolseley Haig, Benares, proposed by Col. H. S. Jarrett, seconded by C. Little, Esq.

J. Woodburn, Esq., C. S., Allahabad, proposed by C. H. Tawney, Esq., seconded by C. Little, Esq.

Bábu Gerindranath Dutt, Hutwa Raj, proposed by Pandit Mahes-chandra Nyáyaratna, seconded by C. Little, Esq.

H. K. W. Arnold, Esq., Calcutta (for re-election), proposed by L. de Nicéville, Esq., seconded by C. Little Esq.

H. N. Thompson, Esq., Monywa, proposed by W. L. Sclater, Esq., seconded by Dr. W. King.

The following gentleman has expressed a wish to withdraw from the Society :—

Denzil Ibbetson, Esq., C. S.

The following papers were read :—

1. *The Antiquities of Belwa-Sirsea*,—By GERINDRANATH DUTT, SUPERINTENDENT OF THE HUTWA RAJ. Communicated by the PHILOLOGICAL SECRETARY.

Ever since my lot was cast to serve this Ráj, I have been labouring under the impression that this very ancient Ráj is replete with objects worthy of an antiquarian's research. The situation of the temple and forest at Thaway and the site of the Hosseypore forts (old capital of the Hutwa Mahárájas), and the winter tour diary of my predecessor, the former Superintendent of the Hutwa Ráj, who is now the Manager, framed this belief into a conviction which was strengthened by learning of the Lauriya-Araraj and Lauriya-Navandgarh pillars in the neighbouring Ráj of Bettiah from Cunningham's *Corpus Inscriptionum Indicarum* (Vol. I, p. 4). Only the other day I issued orders to all native Thikadárs and Putwaries of the villages to inform me at once if they know or hear of the existence of any relic of antiquity; and the reports received from various quarters of this extensive estate made me sanguine of success. The most interesting of these reports is the one received from the Putwary of Belwa Bhaya, a village in lease to the Moniarah Factory, about 6 miles north-west of the sub-division of Gopalgunge and 18 miles from the Hutwa Palace. I could not make time to see the place through press of work till the 3rd instant, when I set out for the place having previously sent a sowar to catch hold of the Putwary and keep him waiting at the Gopalgunge road to lead me to the place.

As we neared the place the existence of very old *Bar* and *Pipal* trees on the sides of the road led me to conclude that we were entering a place of some antiquity. Our camp was pitched at some distance from the spot, but without halting there for rest, notwithstanding the fatigue of a drive over 18 miles of road only partly metalled, we drove direct to

the spot, which is a small jungle of about a bighá, circumscribed by cultivated fields. There under a Pipal tree (which does not appear to be as old as the antiquities themselves) stands a big image of Buddha Gautama, which was formerly buried under a mound of earth and is not yet wholly dug out. Although the Putwary in his report had stated this to be a *Bhairoji's Múrti*, as called by the ignorant villagers, from the description given in it I was at once convinced, even before seeing the spot, that the antiquities must be of a Buddhistic and not Brahmanical period. The length of the whole image, excluding the pedestal and including the arched top which much resembles a *chalechitra* (चालचित्र), is 6', 5" and breadth 3', 4". The figure itself measures 3', 10" from the feet to the mutilated head. It is in a standing posture, having its head cut off down to the chin and both hands mutilated, showing the vandalism of fanatics on the revival of Brahmanism. On both sides of the figure are carved figures of lions and elephants ridden by male human forms measuring 1', 2". Below this are figures of two women about 2 feet in length, having their hands and heads mutilated. The arched top is finely ornamented with decorations. In its middle is the half mutilated face of some form much resembling that of a dragon or *Nṛisimha*, having on its both sides the forms of two fairies flying with folded hands but with mutilated faces. The pedestal on which the image stands has got in its cornice finely carved male human figures in kneeling postures with folded hands. The whole image is carved out of a single block of black marble, and stands on a block reported to have taken root deep in the ground.

Besides this image of Buddha we found, lying on the ground, door-frames, said to have been excavated by some Sádhu. The two door jambs measure 5' 2"  $\times$  10'  $\times$  7', having eight human figures, all in different postures, and beautifully interlacing cornices. The biggest of these figures is 7 inches and others 5 inches. The two jambs correspond to each other in every particular. The top sill measures 5' 1" (broken)  $\times$  1' 2"  $\times$  8½", and shows the figure of Buddha in *Padmāsana* under an arcade. The face and right hand of the figure are mutilated, and the left hand is counting *mantras*. It has very beautifully carved cornices with mouldings. There are several human figures in the uppermost cornice, which is divided into ten little columns each containing two human figures playing musical instruments. On both the extremities are two large figures with mutilated faces.

The bottom sill measures 6' 10" in length of which 5 feet 1 inch is covered with ornaments, and 10 inches on each side appear to bear traces of some inscriptions. This sill measures 10 by 7½ inches. The ornamental part contains beautifully interlacing foliage.

The villagers asserted that images, &c. are found wherever the spot is dug, and on digging out a little I found three large stones, two running at right angles and one horizontal, containing mutilated figures, some riding on a bull, a lion and a tiger, and two other hopelessly mutilated animal figures. Another slab was partially dug out, lying just in front of Buddha's image, bearing some marks which may be those of inscriptions. Hard by the image of Buddha, under the Pípal tree, is a choked up well, which is said to contain a good many images and also the severed limbs of these figures.

We were then led a few yards further out of this jungle to a Pípal tree with shrub-grown pile at its foot, under which the villagers asserted the image of *Sivji* was buried. I only discovered a slab lying there, but cannot say what could be discovered on removing the mound of earth.

Thence we drove to the adjacent village of Sirsea to see the fort of the *Cheroos*. Who these *Cheroos* were, the villagers could not tell; but on questioning the Manager of the Hutwa Ráj I learnt that they were the ancient (aboriginal?) inhabitants now extinct, and that relics of their time were also being found in some other parts of the Ráj. We found no sort of fortification at Sirsea but only a high level *charida* (pastural) ground, of about 25 or 30 bighás, perforated with pits of porcupines. We found there a number of small wells, only 3 feet square, strongly built with small bricks none of which had given way. I saw one of these wells still used by the villagers to water their fields by means of a *Dhenkú*, and I was informed of the existence of one more almost choked up, but they asserted there were 52 in former times.

The villagers then spoke of the existence of some *ghát* where the *Cheroo Rája* used to bathe; but as it was too dark I had to return without seeing it.

2. *On the Dinájpur Copper Plate Inscription of Mahápadra*,—By PROF. F. KIELHORN, C. I. E., Göttingen. Communicated by the PHILOLOGICAL SECRETARY.

3. *First Instalment of the Bower Manuscript, transcript, translation and notes*,—By. DR. A. F. R. HOERNLE.

The papers will be published in the Journal, Part I.

4. *On a Botanical visit to Little Andaman and the Nicobars*.—By D. PRAIN.

While awaiting the arrival of the "*Investigator*" at Port Blair in November 1890, the writer was invited by Col. Cadell, v. c., Chief Commissioner of the Andamans, to visit, in connection with the Botanical Survey of India, the islands of Narcondam and Barren Island, two places

rarely visited and not previously botanically explored. Having obtained the permission of Dr. G. King, F. R. S., the writer was enabled to make this visit in the "*Nancowry*" during March and April 1891. After visiting Narcondam the steamer was required at Port Blair in order to proceed to Little Andaman and Car Nicobar, and Col. Cadell not only permitted the writer to accompany the vessel there, but also, at the suggestion of Mr E. H. Man, kindly directed her to proceed to Batti Malv, a small island without inhabitants and very difficult of access, lying 18 miles south of Car Nicobar. After returning from Batti Malv the steamer took the writer to Barren Island.

The botanical results of the visits to Narcondam and Barren Island, which together formed the central feature of the tour, and the botanical exploration of which was the writer's main purpose, will, it is hoped, soon be made public. The results of the visits to the islands of Little Andaman, Car Nicobar and Batti Malv have been dealt with separately and are now laid before the Society. They have been treated in this fashion, partly because these visits formed an episode in the tour apart from its main object, but chiefly because the lists are less exhaustive, owing to the short time available for collection in each place, than the corresponding lists for Barren Island and Narcondam will be.

The details of the visits are as follows:—the "*Nancowry*" left Port Blair on the morning of Good-Friday, reaching Bomliya Creek, where two natives of Little Andaman, who had been visiting Port Blair, were to be landed, about 2 P. M. As the state of the tidal currents made it inadmissible to leave again till 5-30, the writer had an opportunity of spending three hours in collecting at the mouth of the creek and for a mile or two along the north coast of the island to the east of this. The jungle behind the beach forest was too dense and the time available too short to admit of his penetrating any distance into the interior.

The island of Little Andaman, as seen from the sea, presents a somewhat different appearance from Great Andaman. Instead of being diversified by ridges and valleys and isolated hills, it has a long, low uniform rounded outline similar to that of Sentinel Island as seen from the top of Mount Harriet near Port Blair, and to that of Car Nicobar. It appears, however, to be uniformly covered with forest and to have none of the bare grass-heaths that characterise Car Nicobar. The creek at which the writer landed is the principal one on the north coast of the island. It derives its name from an Andamanese word meaning "flies," and certainly these insects abound there in great numbers and are very troublesome. There is nothing in the mangrove-swamp vegetation to distinguish this from similar places in the Andamans and very little in the beach-forest to characterise the island except that *Casu-*



*arina equisetifolia* is here very plentiful immediately behind the beach. This species, the writer was informed at Port Blair, is equally plentiful in the whole circuit of the coast, so much so that the Andamanese name for the island is Wirra-Maru, *Anglicé* "Casuarina-sand." In Great Andaman this tree, as an indigenous species, is confined to a single bay on the west side of North Island. As in Great Andaman there are no Coco-nut trees on the coast. On the reefs the chief distinctive features are the presence of beds of *Halophila ovalis* and considerable quantities of *Halimeda discoidea*. The visit took place between half-tide and full-tide and no exposed rocks were seen in the vicinity at the time.

Leaving about 6 P. M. the "*Nancowry*" steamed to Car Nicobar to land some men belonging to Kimiós village, who had been in prison at Port Blair. Sáwi Bay was reached on Saturday morning and two men of Moos village, with their canoe, were taken on board to assist in landing on Batti Malv. Owing to the heavy surf running it was found that landing in Kimiós Bay would be very difficult; the vessel therefore, about 2 P. M., anchored off another village 5 miles to the north and the writer was able to land, and walk to Kimiós and back, along two jungle paths, collecting by the way and getting on board again at dusk. Owing to the short time available attention could only be directed to the sea-fence, the beach-forest, the under-growth of the Coco-nut zone, and the mere outskirts of the interior jungle. Car Nicobar is so well-known that no particular notice of its appearance is necessary. There is the usual fringing-reef with a sandy beach, behind this the sea-fence, and within that a zone of beach-forest, of which the area under Coco-nut trees forms an integral portion. The indigenous species are very much like those of the Andamans in similar places—the great distinguishing feature being, of course, the wide Coco-nut zone. The Coco-nuts themselves are particularly fine, and though at Port Blair the finest sorts of Nicobarese and Ceylonese Coco-nuts are carefully cultivated they do not equal those of Car Nicobar either in flavour or size. Yet those of Car Nicobar are said to be by no means the best that the Nicobars can produce. The true interior forest and the grass heaths the writer had no opportunity of examining.

In the night the "*Nancowry*" proceeded to Batti Malv, which was reached at dawn on Easter-day, and the writer, going on shore at once, spent the greater part of the day there, collecting. Landing, even with the assistance of the Nicobarese and their canoe, was effected with considerable difficulty at the north-west corner of the island, where alone it is said to be possible to go on shore. At this point the shore is precipitous, sinking into deep water without any coral fringing-reef and rising into a jagged wall broken somewhat by gullies and small caverns, nearly

everywhere overhanging, and occasionally with tunnelled projecting points. This wall is here on an average from 10–15 feet above high-water-mark. There was no time to circumnavigate the island, but the coast is said to present similar features in its whole circuit, the cliff being highest at the south-west corner of the island and being there about 50 feet high.

The difficulty of landing is largely due to this feature of overhanging cliff and is much increased by the strength of the tidal currents which, even in calm weather, cause a heavy swell to surge into the caverns and along the cliff-face. On reaching the edge of the cliff we find, at this part of the coast, a rocky platform over which the waves evidently wash in the monsoon. The rock is a limestone, and is, by weathering and wave-action, worn into the most fantastic spikes and pinnacles and ridges,\* the sharp edges of which make walking extremely difficult. This platform slopes backwards rather rapidly to a height of about 10 feet more when the jungle commences with the ordinary sea-fence of *Pandanus*, etc.; the platform itself is almost destitute of vegetation, the only species present in it being tufts of *Oldenlandia corymbosa*, *Boerhaavia repens* and *Fimbristylis diphylla*. Within the sea-fence the surface of the island is even and almost flat from side to side of the island.†

The commonest tall tree is *Mimusops littoralis*, which is not here confined to the coast-zone, but extends from side to side of the island. The jungle is less dense than Andamans and Nicobar forests usually are. There is a wonderful absence of climbing species, especially of the class of armed climbers, and there is a remarkably large number of species with edible fruits, a feature that doubtless owes its existence

\* This fantastically-weathered limestone so much resembles the bottom of a coral-pool that the rock has actually been described as a raised coral-reef. (See Hume: *The Islands of the Bay of Bengal*, in *Stray Feathers*, vol. ii, p. 95).

† The Admiralty maps give the island a "landmark-height" of 130 feet which is doubtless correct, and in some maps it will be seen that a hill is indicated in the centre of the island; this, however, is quite incorrect. The height at the north-east corner is, as has been said in the text, about 30 feet; at the south-west corner the height is said to be about 60 feet; assuming that the whole island has an even surface the middle of the island cannot exceed 45 feet. Here, as in all other islands exposed to strong monsoons, the trees immediately on the coast are stunted and dwarfed, becoming progressively taller as we pass inland. The principal tree is *Mimusops littoralis*, and even near the shore this often reaches a height of 60 feet; while trees a few hundred yards inland reach 80 feet; this is the common height of the tree and one which it rarely exceeds. The height obtained by angular measurement from the sea thus not only does not require us to suppose that there is a hill in the middle, but shows that there cannot be anything of the sort and the newer maps correctly indicate that the island has a flat surface.

to the fact that the island, being so remote and so inaccessible, is largely frequented by fruit-eating pigeons and is one, (it has been even said, is the only), known locality in which the large Nicobars pigeon (*Calenas nicobarica*) breeds. Fruit-eating bats too are abundant in the island and are perhaps partly responsible for the introduction of some of these species. Among the more interesting species of this kind is the *Datura*, which in most localities is considered, and probably correctly considered, a species introduced by man but which here undoubtedly must be a bird-introduced plant. Not only is it an exceedingly rare thing for the Nicobarese to visit the island, *Datura* is not a plant with which they are acquainted. The writer, who collected all the possibly introduced species to be found in the neighbourhood of the two villages on Car Nicobar visited by him did not find it present. Moreover it was apparently not found either by Mr. Jelinek during the visit of the frigate "*Novara*" or by Mr. Kurz during his visit to the Nicobars, and no *Solanaceæ* are enumerated in Mr. Kurz's list of Nicobars plants in the Society's *Journal*, vol. xlv, part 2, p. 115 *et seq.* Though uninhabited and apparently very rarely visited there are some Coco-nut trees; the nuts are, however, small and their flavour is rather poor. The few trees that occur are just within the *Pandanus* fence, and there is nothing like a Coco-nut zone. There is no water on the island; still, besides the bats, there occur, of mammalia, both rats and pigs; the traces of the latter were very common and one pig's skull was found in the jungle. The great feature of the island, however, is the enormous multitude of Nicobar pigeons. These swarm everywhere, in the trees and on the ground, and remind one by their numbers of an English "rookery."\* No snakes were seen, but the number and variety of the lizards was very remarkable.

One of the most striking features of the island was the freshness and greenness of the foliage, even in March; a circumstance that, considering the nature of the soil, must be altogether explained by the remarkably heavy dews that are deposited in these latitudes. Landing as the writer did, at day-break, he found the leaves quite as heavily laden with water as they could possibly have been after a thunder-shower, and on the side of the island away from the sun the dews had not yet become completely dissipated at 10 A. M.

After spending eight hours on shore the writer, himself, but not the island,\* exhausted, had reluctantly to return to the "*Nancowry*" which at once steamed off to Andamans, reaching Port Blair on Monday at noon.

\* For an interesting account of the appearance of the island see Mr. Hume's paper already referred to; *Stray Feathers*, vol. ii, pp. 94—97.

In the two subjoined lists the plants obtained during this short tour are enumerated. The first list gives, for the sake of convenience, those collected in Little Andaman. Species for which their occurrence here is the first indication of their presence in the Andaman group are distinguished by an asterisk.

The second list gives the plants obtained in Car Nicobar and in Batti Malv. Those for which this is the first record of their occurrence in the Nicobars and which are not given in the *Enumeration of the plants of the Nicobar Islands* by Mr. Kurz (*Journ. As. Soc. Beng.*, xlv, pt. 2, p. 115—164) are similarly distinguished.

# I. LIST OF PLANTS COLLECTED AT BOMLIYA CREEK, NORTH END OF LITTLE ANDAMAN.

## GUTTIFERÆ.

CALOPHYLLUM INOPHYLLUM Linn.

## MALVACEÆ.

HIBISCUS TILIACEUS Linn.

THESPESIA POPULNEA Linn.

## STERCULIACEÆ.

STERCULIA RUBIGINOSA Vent., var. GLABRESCENS King. (*Sterculia mollis* Kurz in *Jour. As. Soc. Beng.*, xlv, pt. 2, 120 not of Wallich.)

## MELIACEÆ.

### 5. CARAPA OBOVATA Blume.

Having seen both *C. obovata* Bl., and *C. malaccensis* Lamk. *in situ* and examined them as they grow, it is very difficult for the writer to give his assent to the proposition that treats the two as conspecific. *C. moluccensis* is common on rocky coasts, while *C. obovata* is confined to muddy flats, in which it is common, and to mangrove-swamps, of the vegetation of which it forms an integral portion. There is no difficulty with the large suites of specimens that are preserved in the Calcutta Herbarium in distinguishing the one plant from the other, and the residents of Port Blair who know both find it impossible to understand why botanists should wish to believe them to be the same. It may be that their differences, so palpable to the untrained eye, are altogether due to the environment of the two being so different; this, however, if it be a fact, can only be demonstrated by experiment and the *onus probandi*

obviously rests with those who would unite, not with those who can distinguish, the trees; till the point is settled the writer feels compelled to follow Blume in treating them as distinct. In the Andamans *Carapa moluccensis* flowers in November and December, *C. obovata* flowers in March and April.

### LEGUMINOSÆ.

DESMODIUM UMBELLATUM DC.

ABRUS PREGATORIUS Linn.

ERYTHRINA INDICA Lamk.

CANAVALLIA TURGIDA Grah. in Wall. Cat.

This is the common sea-shore *Canavalia* of the Andaman, Nicobar and Malayan coasts and is undoubtedly the plant intended by Graham as *C. turgida* Wall. Cat. n. 5534 A, a plant collected by Wallich in Penang. Cat. n. 5534 B, from Siam (*Herb. Finlayson*), is not represented at Calcutta but most probably is, since Graham and Wallich thought so, the same plant. *C. turgida* is certainly not identical with *C. ensiformis*, even if we admit that the *Canavalia gladiata*, cultivated in the Eastern Hemisphere, is conspecific with the American cultivated plant; nor is it the same as *C. virosa* W. & A., with which Mr. Kurz has identified it (*Journ. As. Soc. Beng.* xlv, pt. 2, p. 127) and which the writer agrees with Mr. Baker in considering the wild form of *Canavalia ensiformis* (*C. gladiata*). The interior of the pod, even more than the different shape, makes the proposal to treat *C. turgida* and *C. virosa* as conspecific quite impossible. Perhaps the confusion of *C. turgida* with *C. virosa* may have arisen from the fact that Wall. Cat. 5534 C, from Ava, is true *C. virosa*. A reference, however, to the Lithographed Catalogue itself shews that Dr. Wallich only doubtfully refers the Ava plant to Graham's species. Mr. Baker doubtfully refers *C. Stocksii* Dalz. & Gibs., Bomb. Fl. 69, to *C. turgida*; this is, in the writer's opinion, highly improbable because 1., *C. turgida* seems always strictly confined to sea-shores and to the banks of muddy estuaries and never has been collected inland; and 2, though it extends from the Salt-lakes near Calcutta and from the Sunderbuns at the top of the Bay of Bengal to the Indo-Chinese and Malayan Coasts generally, it has not yet been found anywhere on the coasts of India proper, of Ceylon, or of the Laccadives.

Though a characteristic sea-shore species, *C. turgida* is not conspecific with the *C. obtusifolia* of the coasts of India proper, which apparently does not occur in the Andamans, the Nicobars, or the Malay Peninsula—on the shores of the Andaman sea, though it does occur in Java (as pointed out by Prof. Miquel) to which island *C. turgida* also extends. \*

The writer has not seen fruiting specimens of a Japanese sea-coast species identified by Mr. Maximowicz and others with *C. obtusifolia* DC. (*C. lineata* DC.; *Dolichos lineatus* Thunbg.) but from a flowering specimens in Herb. Calcutta, it is apparently not specifically identical with the Indian *C. obtusifolia* figured by Dr. Cleghorn (*Madr. Lit. Soc. Journ.*, n. s., i, t. 4). On the other hand there is no apparent difference in flowers, leaves or habit, between the Japanese *Dolichos lineatus* and the Indo-Chinese and Malayan *Canavalia turgida*. If the fruits are also found to agree, and if *Dolichos lineatus* is the true *Canavalia obtusifolia*, *C. turgida* will have to be reduced to *C. obtusifolia*. If the fruits differ *C. turgida* undoubtedly deserves the specific rank assigned to it by Graham, Wallich and Miquel. The name "*C. obtusifolia*," it may be remarked, is as appropriate to the Indian seashore plant, as it is unsuitable to the Japanese littoral *C. lineata* and to the Indo-Chinese and Malayan littoral *C. turgida*.

10. *VIGNA LUTEA* A. Gray.*MUCUNA GIGANTEA* DC.*DERRIS SCANDENS* Benth.*DERRIS ULIGINOSA* Benth.*PONGAMIA GLABRA* Vent.15. *CÆSALPINIA BONDUCELLA* Flem.*CYNOMETRA RAMIFLORA* Linn.

## RHIZOPHOREÆ.

*CERIOPS CANDOLLEANA* Arn.*BRUGUIERA GYMNO RHIZA* Lamk.

## COMBRETACEÆ.

*TERMINALIA CATAPPA* Linn.

## MYRTACEÆ.

20. *BARRINGTONIA SPECIOSA* Forst.

## RUBIACEÆ.

*HYDNOPHYTUM ANDAMANENSE* Becc., *Malesia* ii, 156, t. 48, fig. 8—13.*WEBERA KURZII* Hook. f.*GUETTARDA SPECIOSA* Linn. f.*IXORA BRUNNESCENS* Kurz.

Add to previous descriptions :—Flowers white, sweet smelling, corolla tube  $\frac{1}{2}$  in. long, teeth  $\frac{1}{2}$  in. long; berries creamy white with purple meridional elongated blotches.

25. *MORINDA CITRIFOLIA* Linn., *var. BRACTEATA* Hook. f. (*M. bracteata* Roxb.

## COMPOSITÆ.

WEDELIA SCANDENS C. B. Clarke.

## MYRSINÆ.

ARDISIA HUMILIS Vahl. (*A. littoralis* Andr.).

## SAPOTACEÆ.

MIMUSOPS LITTORALIS Kurz.

Common here, as elsewhere in the Andamans and Nicobars, in the beach forest. Three or four lofty trees recently blown down yielded from among their topmost branches, the species n. 30, n. 31, n. 43, n. 44, n. 45, n. 46, n. 47, n. 53, n. 54, and n. 55 of this list.

## APOCYNÆ.

OCHROSIA BORBONICA Gmel.

This species is much more frequent in the Andamans than *Cerbera Odollam*, and the fruits, especially when the outer skin is removed and only the stringy endocarp is seen, are not distinguishable from those of the latter species.

## ASCLEPTADACEÆ.

30. DISCHIDIA NUMMULARIA R. Br.

\* DISCHIDIA RAFFLESIANA Wall.

Not previously recorded from the Andamans. The ants present here in the ascidial leaves were not 'harmless' as Dr. Wallich found those at Singapur to be.

## BORAGINÆ.

CORDIA SUBCORDATA Lamk.

Very common.

TOURNEFORTIA ARGENTEA Linn.

## CONVOLVULACEÆ.

IPOMÆA DENTICULATA Choisy.

35. IPOMÆA BILOBA Forst.

## VERBENACEÆ.

PREMNA INTEGRIFOLIA Linn.

CLERODENDRON INERME Gærtn.

## LAURINÆ.

HERNANDIA PELTATA Linn.

Very common.

## SANTALACEÆ.

CHAMPEREIA GRIFFITHIANA Baill.

A very common tree in the coast-zone, 30—50 feet high.

## CASUARINÆÆ.

## 40. CASUARINA EQUISETIFOLIA Forst.

One of the commonest trees in the coast-zone just within the *Pandanus* sea-fence. In Great Andaman this species only occurs in one spot, Casuarina Bay, on the west coast of North Andaman.

## CYCADACEÆ.

CYCAS RUMPHII Miq.

## HYDROCHARIDÆ.

## \* HALOPHILA OVALIS R. Br.

Very common; this has not previously been met with on Andaman reefs.

## ORCHIDACEÆ.

## \* DENDROBIUM SECUNDUM Lindl.

This occurs in South Andaman and in the Coco group also.

DENDROBIUM TENUICAULE Hook. f.

Also common at Port Blair in South Andaman.

## 45. DENDROBIUM ANCEPS Roxb.

## \* DENDROBIUM TERMINALE Par. &amp; Reichb. f.

This is also common, along with the preceding, at Port Blair in South Andaman.

AERIDES MULTIFLORUM Roxb.

## AMARYLLIDACEÆ.

CRINUM ASIATICUM Linn.

## LILIACEÆ.

DRACENA ANGUSTIFOLIA Roxb.

## FLAGELLARIÆÆ.

## 50. FLAGELLARIA INDICA Linn.

## PANDANACEÆ.

PANDANUS ODORATISSIMUS Linn. f.

## NAIADACEÆ.

CYMODOCEA CILIATA Ehrenb.



## FILICES.

- DAVALLIA SOLIDA Sw.  
 POLYPODIUM QUERCIFOLIUM Linn.  
 55. POLYPODIUM ADNASCENS Sw.  
 ACROSTICHUM SCANDENS J. Sm.

## ALGÆ.

- SARGASSUM ILICIFOLIUM Agardh.  
 TURBINARIA ORNATA Lamk.  
 HALIMEDA OPUNTIA Lamk.  
 60.\* HALIMEDA DISCOIDEA Dcne.  
 PADINA PAVONIA Gaill.

## II. LIST OF THE PLANTS COLLECTED IN CAR NICOBAR AND BATTI MALV.

## ANONACEÆ.

- POPOWIA PARVIFOLIA Kurz.  
 Car Nicobar ; Batti Malv.

## MENISPERMACEÆ.

- CYCLEA PELTATA H. f. & T.  
 Batti Malv.

## CAPPARIDEÆ.

- GYNANDROPSIS PENTAPHYLLA DC.  
 Car Nicobar ; a weed round the huts of natives at Kimiós.  
 \* CAPPARIS AMBIGUA Kurz.  
 Batti Malv ; a common unarmed climber ; previously only known from the Andaman group.

## GUTTIFERÆ.

5. CALOPHYLLUM INOPHYLLUM Linn.  
 Car Nicobar and Batti Malv.

## MALVACEÆ.

- SIDA ACUTA Burm.  
 Car Nicobar ; a weed near Kimiós village.  
 URENA LOBATA Linn.  
 Car Nicobar ; a weed near villages.  
 HIBISCUS TILIACEUS Linn.  
 Car Nicobar and Batti Malv.  
 THESPESIA POPULNEA Linn.  
 Car Nicobar and Batti Malv.

## STERCULIACÆ.

10. *STERCULIA RUBIGINOSA* Vent., var. *GLABRESCENS* King. (*S. mollis* Kurz, not of Wallich.)

Car Nicobar and Batti Malv.

*MELOCHIA VELUTINA* Bedd.

Car Nicobar.

## RUTACEÆ.

*GLYCOSMIS PENTAPHYLLA* Corr.

Car Nicobar.

*TRIPHASIA TRIFOLIOLATA* DC.

Car Nicobar.

## AMPELIDEÆ.

*VITIS PEDATA* Vahl.

Batti Malv.

15. *LEEA SAMBUCINA* Willd.

Car Nicobar.

*LEEA GRANDIFOLIA* Kurz.

Batti Malv, very common.

## SAPINDACEÆ.

*LEPIDOPETALUM JACKIANUM* Radlk. (*Cupania Jackiana* Hiern.)

Car Nicobar, flowering specimens; Batti Malv; fruiting specimens. There is now no doubt that this species is correctly referred to *Lepidopetalum* by Prof. Radlkofer. The flower-buds are oval, pointed; the 4 green, lanceolate calyx-segments alternate with 4 extremely small, white cordate-acute petals attached to the face of each of which is a single large scale, connate by its margins with the edges of the corresponding petal and forming along with it a small, peltate-infundibuliform pouch; the stamens are 8 in number with glabrous, slender, short filaments and oblong, pilose anthers; the ovary is 2-celled; the fruit, reddish-brown externally, is bright scarlet within, usually the seed of one of the two cells is abortive; the ripe seeds are black, covered with a mucilaginous substance and embraced, as to their lower third, in a pink, cup-shaped, thick, fleshy arillus. It is one of the favourite fruits with *Cakinas nicobarica* and the other frugivorous pigeons. Even if, with Bentham and Hooker, (*Gen. Plantar.* i, 399), generic rank is not accorded to *Lepidopetalum*, Hiern's location of the species in *Cupania* (*Flor. Brit. Ind.* i, 678) is not valid, since, as these authors show, *Lepidopetalum* is more nearly related to *Ratonia*, as understood by them, than to *Cupania*.

ALLOPHYLUS COBBE Blume.

Batti Malv; the specimens agree exactly with authentic specimens of *A. littoralis* Blume.

ERIOGLOSSUM EDULE Blume.

Batti Malv.

### ANACARDIACEÆ.

20. SEMECARPUS HETEROPHYLLA Blume.

Batti Malv.

### CONNARACEÆ.

\* CONNARUS sp.

Batti Malv; the specimens are in leaf only, but agree well with specimens of an undescribed *Connarus* from the Nicobars about to be published by Dr. G. King in the *Annals of the Roy. Bot. Garden, Calcutta*.

### LEGUMINOSÆ.

DESMODIUM UMBELLATUM DC.

Batti Malv.

ABRUS PRECATORIUS Linn.

Car Nicobar and Batti Malv.

EYTHRINA INDICA Lamk.

Car Nicobar.

25. CANAVALIA TURGIDA Grah.

Batti Malv.

DERRIS SCANDENS Bth.

Batti Malv.

DERRIS ULIGINOSA Bth.

Batti Malv.

SOPHORA TOMENTOSA Linn.

Car Nicobar.

CÆSALPINIA BONDUCELLA Flem. (*C. Bonduc* Kurz, not of Linn.)

Batti Malv.

30. CASSIA OCCIDENTALIS Linn.

Car Nicobar, a weed near Kimiós village.

### COMBRETACEÆ.

TERMINALIA CATAPPA Lamk.

Car Nicobar, Batti Malv.

GYROCARPUS JACQUINII Roxb.

Batti Malv.

## MYRTACEÆ.

BARRINGTONIA SPECIOSA Forst.

Batti Malv.

## MELASTOMACEÆ.

MEMECYLON EDULE Roxb. var. ?—.

Batti Malv.

## CUCURBITACEÆ.

35. \* TRICHOSANTHES PALMATA Roxb.

Car Nicobar, Batti Malv.

\* MUKIA SCABRELLA Arn.

Batti Malv.

## CORNACEÆ.

ALANGIUM SUNDANUM Miq.

Batti Malv, a very common large climber.

## RUBIACEÆ.

\* OLDENLANDIA CORYMBOSA Linn., var.—.

Batti Malv, on the bare limestone rocks between the sea and the *Pandanus* fence. The specimens are exactly like those of *Hedyotis alsinæfolia* R. Br. in Wall. Cat. n. 873.

WEBERA KURZII Hook. f.

Car Nicobar.

40. OPHIORHIZA MUNGOS Linn.

Car Nicobar.

GUETTARDA SPECIOSA Linn.

Batti Malv.

IXORA BRUNNESCENS Kurz.

Car Nicobar, Batti Malv.

IXORA CUNEIFOLIA Roxb.

Car Nicobar.

IXORA CUNEIFOLIA Roxb., var. MACROCARPA Kurz.

Batti Malv.

45. MORINDA CITRIFOLIA Linn., var. BRACTEATA Hook. f. (
- M. bracteata*
- Roxb.)

Car Nicobar, Batti Malv.

MUSSENDA MACROPHYLLA Wall.

Car Nicobar.

PADERIA FETIDA Linn.

Batti Malv.

## COMPOSITÆ.

WEDELIA SCANDENS C.B. Clarke.

Car Nicobar, Batti Malv.

## GOODENOVIÆ.

SCÆVOLA KÆNIGII Vahl.

Batti Malv.

## MYRSINÆ.

50. ARDISIA HUMILIS Vahl. (*A. littoralis* Andr.)

Car Nicobar, Batti Malv.

## SAPOTACEÆ.

MIMUSOPS LITTORALIS Kurz.

Car Nicobar, Batti Malv.

## EBENACEÆ.

DIOSPYROS KURZII Heirn.

Batti Malv.

## APOCYNÆ.

OCHROSIA BORBONICA Gmel.

Car Nicobar.

TABERNÆMONTANA CRISPA Roxb.

Car Nicobar, Batti Malv.

55. PARSONSIA SPIRALIS R. Br.

Car Nicobar.

## ASCLEPIADACEÆ.

DISCHIDIA GRIFFITHII Hook. f. ? (*D. bengalensis* Kurz, not of Colebr.)

Car Nicobar. There are no authentic examples of *D. Griffithii* at Calcutta, with which to compare the plant obtained by the writer in Car Nicobar, and by Mr. Jelinek in Kamorta and Katschall. There are specimens of *Novara* n. 115 at Calcutta, and an examination of these shows that they are precisely the same as the present Car Nicobar plant and that they have been erroneously referred by Mr. Kurz to *D. bengalensis*. The Nicobars plant has a hirsute corolla throat, the corolla-throat in *D. bengalensis* is glabrous.

## LOGANIACEÆ.

STYCHNOS ACUMINATA Wall.

Batti Malv.

## BORAGINÆÆ.

CORDIA SUBCORDATA Lamk.

Batti Malv.

TOURNEFORTIA ARGENTEA Linn.

Car Nicobar.

## CONVOLVULACEÆ.

60. IPOMŒA DENTICULATA Choisy.

Car Nicobar, Batti Malv.

IPOMŒA CYMOSEA Roem. & Schult.

Car Nicobar.

IPOMŒA BILOBA Forsk.

Car Nicobar, Batti Malv.

CONVOLVULUS PARVIFLORUS Vahl.

Batti Malv.

## SOLANACEÆ.

\* SOLANUM MELONGENA Linn.

Car Nicobar; near huts of natives at Kimiós.

65. \* DATURA FASTUOSA Linn.

Batti Malv; interesting as an addition to the Nicobar Flora and as proving from its presence in this island that human agency is not always necessary to account for the dispersal of the species.

## ACANTHACEÆ.

ERANTHEMUM CINNABARINUM Nees, *var. succisifolium* Clarke. (*E. succifolium* Kurz).

Car Nicobar, Batti Malv.

PERISTROPHE ACUMINATA Nees.

Car Nicobar.

## VERBENACEÆ.

PREMNA INTEGRIFOLIA Linn.

Batti Malv.

CLERODENDRON INERME Gaertn.

Car Nicobar, Batti Malv.

70. CLERODENDRON PANICULATUM Linn.

Car Nicobar.

CALLEGARPA LONGIFOLIA Lamk.

Car Nicobar.

## LABIATÆ.

## \* OCIMUM BASILICUM Linn.

Car Nicobar ; a weed near Kimiós village.

The dispersal of the species of this genus—the *Tulsi* plants—is somewhat curious. In Kamorta, Katschall and Nancowry, where Hindu convicts have been stationed, it is the true or sacred *Tulsi* [*O. sanctum*] that has become naturalised. Here, where no Hindus have lived, it is *O. Basilicum* that is grown by the natives, to whom one *Tulsi* is as good as another. In the Laccadives, where the people are Mussalmans, and to whom the sacred *Tulsi* does not specially appeal, it is the *Ram Tulsi* (*O. gratissimum*) that occurs.

## NYCTAGINEÆ.

## BOERHAAVIA REPENS Linn.

Batti Malv, on the rocks outside the *Pandanus* sea-fence.

## \* PISONIA ACULEATA Linn.

Batti Malv.

## 75. \* PISONIA ALBA Spanoghe.

Batti Malv.

## \* PISONIA EXCELSA Blume.

Batti Malv.

## AMARANTACEÆ.

## \* AMARANTUS SPINOSUS Linn.

Car Nicobar, near Kimiós village.

## \* ACHYRANTHES ASPERA Linn.

Car Nicobar, a weed near Kimiós village. Only the sea-shore variety, (*A. porphyristachya* Wall.), has hitherto been known to occur in the Nicobars ; this was obtained by Mr. Jelinek of the "*Novara*."

## ÆRUA LANATA Juss.

Car Nicobar, Batti Malv.

## LAURINEÆ.

## 80. HERNANDIA PELTATA Linn.

Car Nicobar.

## ARISTOLOCHIACEÆ.

## \* ARISTOLOCHIA TAGALA Cham. &amp; Schlecht.

Batti Malv.

## EUPHORBIACEÆ.

## EUPHORBIA ATOTO Linn.

Car Nicobar.

GLOCHIDION CALOCARPUM Kurz.

Car Nicobar.

FLUEGGEA MICROCARPA Blume.

Car Nicobar, Batti Malv.

85. BREYNIA OBLONGIFOLIA Muell.-Arg.

Car Nicobar.

BRIDELIA TOMENTOSA Blume.

Car Nicobar.

ALCHORNEA RUGOSA Muell.-Arg.

- Car Nicobar. The specimens agree exactly with authentic examples of *A. javensis* Muell.-Arg.

CLAOXYLON LONGIFOLIUM Muell.-Arg.

Car Nicobar.

CLAOXYLON MOLLE Endl.

Batti Malv.

90. \* GELONIUM ? sp.

Batti Malv. The specimens are without fruit and perhaps do not belong to this genus. They differ from anything hitherto reported from the Nicobars.

#### URTICACEÆ.

PIPTURUS VELUTINUS Wedd.

Car Nicobar.

FIGUS HISPIDA Linn., *var. DEMONUM* Kœnig.

Car Nicobar, Batti Malv.

FIGUS RUMPHII Vahl.

Batti Malv.

#### CYCADACEÆ.

CYCAS RUMPHII Miq.

Car Nicobar, Batti Malv.

#### PALMEÆ.

95. COCOS NUCIFERA Linn.

Car Nicobar, Batti Malv.

ARECA CATECHU Linn.

Car Nicobar.

#### PANDANACEÆ.

PANDANUS ODORATISSIMUS Linn. f.

Car Nicobar, Batti Malv.



## LILIACEÆ.

DRACENA ANGUSTIFOLIA Roxb.

Car Nicobar, Batti Malv.

## AMARAYLLIDACEÆ.

CRINUM ASIATICUM Linn.

Batti Malv.

## FLAGELLARIÆ.

100. FLAGELLARIA INDICA Linn.

Batti Malv.

## ORCHIDACEÆ.

SARCANTHUS ? sp.

Batti Malv. The specimen is in fruit only.

EULOPHIA DECIPIENS Kurz.

Car Nicobar.

## NAIADACEÆ.

CYMODOCEA CILIATA Ehrenb.

Car Nicobar.

## CYPERACEÆ.

CYPERUS PENNATUS Lamk.

Batti Malv.

105. FIMBRISTYLIS DIPHYLLA Vahl.

Batti Malv, on rocks between the sea and the *Pandanus* belt.

## GRAMINEÆ.

PANICUM FILIPES Nees.

Car Nicobar.

ISCHÆMUM MUTICUM Retz.

Car Nicobar, Batti Malv.

ERAGROTIS PLUMOSA Linn.

Car Nicobar.

## FILICES.

POLYPODIUM QUERCIFOLIUM Linn.

Car Nicobar, Batti Malv.

110. POLYPODIUM ADNASCENS Swartz.

Car Nicobar, Batti Malv.

POLYPODIUM PHYMATODES Linn.

Car Nicobar.

LYGODIUM FLEXUOSUM Swartz.

Car Nicobar.

### ALGÆ.

SARGASSUM ILICIFOLIUM Agardh was the only seaweed seen on Batti Malv. About a dozen seaweeds were obtained on Car Nicobar; they have have not yet been determined.

5. *Notes on some native Ephemeridae in the Indian Museum*,—By REV. A. E. EATON, M. A. Communicated by the SUPERINTENDENT, INDIAN MUSEUM.

6. *Catalogue of the Diptera of the Oriental Region*, Part III,—By MONS. J. M. F. BIGOT. Communicated by the SUPERINTENDENT, INDIAN MUSEUM.

The papers will be published in the Journal, Part II.

### LIBRARY.

The following additions have been made to the Library since the meeting held in November last.

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(Nos. I to III.—1891.)

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THE HONORARY PHILOLOGICAL SECRETARY.

~~~~~  
"It will flourish, if naturalists, chemists, antiquaries, philologers, and men of science in different parts of *Asia*, will commit their observations to writing, and send them to the Asiatic Society at Calcutta. It will languish, if such communications shall be long intermitted; and it will die away, if they shall entirely cease."  
~~~~~

SIR WM. JONES.

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# JOURNAL

OF THE

## ASIATIC SOCIETY OF BENGAL.



Part I.—HISTORY LITERATURE, &c.

No. I.—1891.



*Report on Archæological Excavations in Bijnor, N.-W. P.—By A. MACAULAY  
MARKHAM, C. S., F. R. G. S., F. Z. S.*

In November 1884, His Honor Sir Alfred Lyall placed a sum of money at my disposal for the purpose of making certain archæological excavations in the Bijnor district.

I first excavated a strange looking mound of evidently great age, at Típ on the left bank of the Ganges Khádir, 15 miles N. N. E. of Bijnor. In this no relic chamber or relics of any kind were found. I have little doubt, however, that the mound was of Buddhist origin. A square doorless structure was disclosed, which I take to have been the plinth of a temple. In the light of fuller experience, I should like to take an opportunity of again examining this mound, which is not far from the border of the Muzaffarnagar district.

Six gold Indo-Scythic coins, of great beauty and rarity, were found near but outside the base of this mound. These were as follows :—

Three of Vasu Deva—Average weight 120·17 grains.

Two of „ ditto (differing) „ 118·87 do.

One of Bhri Sháka. Weight 120·0 grains.

These kings were contemporary in Northern India with the earlier Gupta kings, or say not later than A. D. 200.\* The coins were, by order of Government, sent to the Curator of the Lucknow Museum.

\* [Vasu Deva reigned from about 122-176 A. D. ; the Gupta rule commenced about 319 A. D. Ed.]

Some silver coins, of comparatively recent date, and of no archæological value, were found buried close under the surface of this mound. They were sold as silver, and the proceeds credited to the excavation fund.

I next commenced operations on a fine mound in the old ruined Fort of Mor Dhaj (*Mayúra Dhawja*, also known formerly,\* but not now apparently, as *Munavvar Júr*), lying 7 miles north-east of Najibábád, to which I drew the attention of General Cunningham, R. E., many years ago, and which has been briefly described by him in the *Archæological Reports*, Volume II, page 237.

The mound was in dense jungle, and used† to be known as *Shigri* ((Qy. *Sher-Garhí*, or *Shri-Garhí* ?), but I now find that this name, like that of *Munavvar Júr*, has dropped out of local use and knowledge.

After careful clearing of the overgrowth of jungle, the mound was disclosed, 35 feet in height, and 308 feet in circumference, circular. A closer examination showed that the outer portion of the mound was composed of brick rubbish, the remains of some large superstructure. The size and importance of this building, originally, no doubt, a large Chaitya, with the usual series of umbrella-like discs composing its lofty spire, and in later days probably a temple, may be guessed at from the fact that the entire surface of the mound, to a depth of from 3 to 8 feet, and many square yards of plain surface around its base to a similar depth, were covered with broken brick debris. I am informed that, within the memory of living men, there were still portions of the superstructure standing on the mound, but that the materials were utilized in the construction or repair of bridges on the Najibábád and Kotdwára road, which skirts the base of the old fort, at a distance of about 400 yards. If this be true, it is a matter of very serious regret.

I first had the covering of debris very carefully removed from six foot lines on the centre of all four sides, these lines meeting at top, and being extended to the foundation, 7 feet below the present level of the soil. In this debris nothing was found of any interest. It was all composed of pieces of brick, which had mostly been of the large size usually found in these old remains. No pieces of building stone were found.

The only things of any interest found in this or in the surrounding debris were the following :

(a). A portion of a terra-cotta figure ; left leg from groin to ankle,  $7\frac{1}{2}$  inches ; right thigh (only)  $4\frac{1}{2}$  inches. Wearing a tight *dhott*, with an ornament over the seat of the genital organ. (This ornament differs

\* Within the last 20 years.

† Within 20 years back.

from that in Fig. 4, Pl. XIX, Prinsep's Thomas' Indian Antiquities). The figure was in very high relief on a brick slab, and there are traces of drapery or other carving on the slab between the legs. Found in debris of well 60 yards north-east.

(b). A small *headless* figure (terra-cotta) probably of Buddha the Teacher, seated cross-legged, with soles of feet upturned; with the elbows on the thighs, and the hands (broken) raised in front of the body. The fingers were originally no doubt in contact, right index on left, in the attitude of demonstration. The figure is seated on a lotus ornamented couch, supported on the heads of two couchant antelopes. As the antelope was the totem or cognizance of Santánáth, the 16th Jain hierarch, the statuette *may* be his, but I take it to be a Buddha.

Total original length of figure about  $4\frac{1}{2}$  inches. Present total length of fragment of figure, seat and supporters, 6 inches. This was also found in the debris near the well, not on the mound.

(c). Head, neck and shoulders of a small sandstone figure, probably female. The hair arranged in a highly ornamental manner in a double roll. Features undistinguishable. This figure has evidently been broken off a larger work, of which no portions were found. No other pieces of this stone were found.

(d). A portion of apparently the lintel of a door. It is of very heavy black basalt. It represents a figure seated on its hams, with the legs partly crossed, with a club (?) held upright in each hand, the base of the club resting on the thigh of the figure. This figure is within a Chaitya.

On each side of the Chaitya are what appear to be issuant demons or elephants. Sculpture of the rudest. There is an indication of a trunk and large ears, so that the figure may have been meant for Gaṇeśa; but the position is against that, and there is no sign of the usual rat. Features of figure gone. No other portions of this series, nor of any figures in this stone were found. Height of Chaitya 7 inches. Interior of Chaitya,  $3 \times 2\frac{1}{2}$  inches. This was found *within* the old well, in the accumulated rubbish which filled it.

(e). A conical implement of stone. Either a hammer or a rice-husker. It is marked with a series of indented sockets all round the thick end, which would seem to have been intended to give the fingers a purchase or grip of the implement when in use. The lower end is much chipped. Extreme length  $5\frac{1}{2}$  inches; extreme breadth  $3\frac{1}{8}$  inches.

(f). A small brick fragment from a canopy of a figure. Debris of main mound.

(g). A mason's plumb weight of burnt earth, shaped like some in

use to-day, with a hole in the centre of the top in which to fasten the cord. In the debris in the old well.

The core of the mound, that is to say, the original stúpa was revealed by the clearing away of the debris from the above lines, and proved to be conical in general elevation, with a truncated top; the superficies being found to be in a series of deep steps all round, the bottom step, *i. e.*, the plinth, being much wider on top than the others, thus forming the usual ceremonial promenade (*parikarma*) surrounding the stúpa. The foundation of the structure is 7 feet below present ground level, but the latter is, to the depth of at least an average of 3 feet, composed of debris. There was no trace of a railing, nor were any pieces of a railing found. The surrounding earth might repay digging.

I then commenced to sink a shaft down the exact centre of the stúpa. Two and a half feet below the platform-like top, the relic chamber was found. It was completely full of terra-cotta objects, in loose mould, huddled in without care or arrangement, and much broken, thus showing, I think, that the chamber had already been opened, and no doubt rifled of its casket and of anything supposed to be valuable.

These terra-cotta objects found in the relic chamber, consisted of the following :—

*First.* At least one thousand small tablets  $3'' \times 2''$  from  $\frac{5}{8}''$  to  $\frac{7}{8}''$  thick at the base, and from  $\frac{3}{8}''$  to  $\frac{5}{8}''$  at top. They are all stamped from the same die, or cast in the same mould, and bear a seated figure similar to those of Buddha the Ascetic, in the usual position of meditation, with the feet impossibly folded, soles uppermost, and the hands joined in the lap, palms upwards, the right hand being on top. The figure is, however, *naked*, and Buddha is seldom so represented. It is seated upon an ornamented circular pedestal, and is in *mezzo rilievo*. The hair is arranged in a knot on the top of the head, and from that knot appears to rise a high plume-like ornament with a spreading top, possibly representing peacocks' feathers. This might, however, be intended to represent the top of the ornamental back of the seat, but I take it to be a head ornament. There is a halo or 'glory' round the head. There are two diminutive naked male figures as supporters, one on either side; holding in their inward hands (*i. e.*, one in the right hand and the other in the left) objects which may be wands of office or long bows. These tablets bear no inscription. There is nothing on the reverse. They were no doubt votive tablets. Several hundreds of these tablets were broken to pieces. Each tablet was separate, and none were enclosed in clay or in model stúpas. A collection has been deposited in the Lucknow Museum, two were submitted to the Government N. W. P., and about six hundred have been left with my successor in Bijnor.

As far as I can discover, no such tablets have been hitherto found anywhere else. In his description of Sárnáth, (Archæological Reports, Volume I, page 119), General Cunningham says incidentally that he has seen in Burma accumulated heaps of small burnt clay figures of Buddha, but he does not describe them. If those were not similar to these now discovered by me, then my find is, I believe, unique. There is no other mention of any similar figures in the entire series of the Archæological Reports. The figures *may*, however, represent some Jain patriarch, but I doubt it, from the immense number of them, and their being evidently in a relic chamber.

*Secondly.* Two large circular terra-cotta medals, both from the same die;  $3\frac{1}{2}$  inches in outside diameter. Having been less thoroughly baked than the tablets, these medals were much broken, the more beautiful of the two being unfortunately badly shattered.

These handsome medals are quite unique. Somewhat similar representations are said to be depicted on the Bharhut stones, now in the Indian Museum, (*vide* General Cunningham's *Bharhut Stúpa*, Pl. XIII, which, however, is not at my hand for reference). Also see Prinsep's (Thomas') Indian Antiquities, Fig. 1, Pl. XIX, where is figured a portion of a clay medal found at Bihat. Pakna Bihar (Archæological Reports, Vol. XI, p. 31, Pl. XII.), Śravastī (*ibid.*, p. 89, Pl. XXVIII), Dharáwat (*ibid.*, Vol. XVI, p. 45, Pl. XIII), and Kusinagara (*ibid.*, Vol. XVIII, p. 70) are, as well as I can discover the only places where terra-cotta seals have been found. None of the seals found at the first three places are similar to, or of such fine execution as mine; and unless some of the Kusinagara seals were similar, which apparently was not the case, or they would certainly have been described, those now found by me are the first of their kind.

Mr. Carlleyle gave no plate of his (Kusinagara) seals, but a very meagre description of some only; a description which does not represent either of the Mayúra Dhwaḡa seals. Lac seals have been found in many stúpas, but none bearing an impress like these.

The following is a description of these beautiful medals. In the centre is Buddha the Ascetic seated in the usual attitude save that there is an appearance of something on his right, which may, however, be an effect of the earth which was adherent to the seal. There is a halo round his head, and the semblance of a necklace, which may possibly be the edge of the mantle, leaving the right shoulder bare. Buddha is seated within a handsome Chaitya with a lofty pinnacle of the diminishing umbrella type, decorated with streaming garlands. On either side of the pinnacle are flying human figures, with perhaps drums or other musical instruments. These flying figures are said by General



Cunningham (Arch. Report, I, 263) to be the usual accompaniments of the Ascetic Buddha. On either side of the body of the Chaitya stands a male figure as a supporter.

These wear the *dhoti*, and one a necklace. Their hair is dressed high, each in a different style, and there is a halo or 'glory' round the head of each. (Possibly the figure on the proper left, wearing the necklace, is a woman?) Each would seem to carry a *chaupri* in the outer hand, and at least one, if not both, a bow or wand of office in the inner. (There is an indication that the line forming this implement near the figure on the proper left is part of an oval ornamental ring round the Chaitya.) It is impossible to say clearly what this figure has in his right hand. There are also some matters unintelligibly depicted alongside of each figure, especially to the left of the left hand supporter. There are two marks on either side of the Chaitya which look like conventional palm trees.

It will be noted that on the tablets Buddha is large, while the supporters are diminutive. Here Buddha is small and the supporters gigantic. Underneath the base of the Chaitya is the Buddhist creed, of the usual formula "*Ye Dharmmā hetuprabhavā &c.*" Under the inscription is a strange figure, apparently a woman, kneeling, with uplifted adoring hands, before what looks like a pan with handles set upon a *chūla*. This figure may be that of the Bhikṣuṇī *Utpalā* or *Utpalavarnā*, who was the first person to see Buddha after his return to earth at Sankisa from his visit to his mother in the Trayastrimśa heavens; (Cunningham, Archæological Report, XI, p. 26) or it may represent something of the nature of the Burmese *shiko*. (See Cunningham, regarding some kneeling figures, somewhat analogous; Arch. Report, Vol. I, p. 9.) On the reverse of that one of these two large medals which was photographed is a rude delineation of the Bo tree, cut after the stamping of the medal. This is not on the duplicate medal. The least broken of the two large medals, and six copies of the photograph of both sizes of medal by Col. Waterhouse were submitted to the Government N.-W. P.\* The finest but most broken medal is in the Lucknow Museum.

*Thirdly.* About two dozen smaller terra-cotta medals. Several of these were broken to pieces. The clearest one has been photographed. They contain a panel with a seated ascetic Buddha, having two attendants on each side. The panel is surmounted by a miniature stūpa in the centre, with a still smaller one on either side of it. The panel and stūpas are surrounded by a wreath of bells. Underneath the panel is

\* [This photograph, together with a description of the medals, was published in the Proceedings of the Society, for April 1887. Ed.]

the Buddhist creed, as above. Specimens of this medal have been deposited in the Lucknow Museum.

*Fourthly.* One copper *salai* or instrument for applying antimony to the eyes, similar to those found in the Bihat excavations (*vide* Prinsep's (Thomas') *Indian Antiquities*, Fig. 18, Pl IV.)

Judging from the type of character used in the inscriptions on these medals, the stamp was probably of the 8th, or at latest of the 9th century of the Christian era. The date of the building of the stúpa cannot therefore be earlier than A. D. 700.

The excavating shaft was carefully continued down to the foundations, but nothing else was found. The entire mound consists of an uniform mass of solid brick work. The bricks are chiefly of large size ( $14 \times 8 \times 2\frac{1}{4}$ ), laid in mud. They are all well-burnt, some being very hard. Small galleries, driven in at about present ground level, or a little lower, and at the cardinal points, might yield something. The shaft ought to be thatched over before the rains, or it will fill with water, and the mound will be much injured thereby.

The old fort of Mordhaj (Mayúra Dhwaja), if it were built by the king of that name, would date from about the beginning of the 10th century of our era. A Mayúra Dhwaja reigned in Gauda (Gonda), a portion of the ancient realm of Ayodhya, in 900 A. D. (*Archæological Report*, I, 329. But see Vol. XVII, 98, where General Cunningham may be understood as placing Mayúra Dhwaja and his brethren in the 8th century A. D.). Mr. Carlleyle, not a very trustworthy authority, however, (*Archæological Report*, VI, 233) has a Mora Dhwañ flourishing anywhere between 50 and 210 B. C.; while the popular tradition, which makes him contemporary with the Pañḍus, would relegate him at least to the 14th century before Christ! We may assume, I think, that the fort was not built before the beginning of the 10th century. If so, and if I am correct in referring the characters on the seals to the 8th or at latest the 9th century, (and I think that the former is more likely,) then, of course, the stúpa which I have excavated is much older than the ruined fort which surrounds it.

The whole country round the fort, for several square miles, is covered with almost uninterrupted traces of ancient ruins, chiefly composed of pieces of the large bricks of the builders of those days. All cuttings in the course of the work of widening the Najibábád and Kot-dwára road, about to be taken in hand, should be carefully carried out, and well watched, where they pass through these ruins. The place must have been the site of a large and wealthy city. It may have been one of those many in this neighbourhood which perished in the exterminations of the ruthless Tímúr, at the close of the 14th century. There

are many such brick ruins in the Bijnor district, some of them, and the most extensive, in the middle of dense forest; their very names vanished from memory long ages ago. All these remains would, I think repay excavation. I grieve that I never had leisure to take it up.

*The Coins of the Chaghatái Mughals.*—By E. E. OLIVER.

(With four plates.)

In the January number of the of the Royal Asiatic Society's Journal for the past year, I endeavoured to give a short geographical sketch of the Chaghatái Khánate, and a historical outline of the rulers of this, the most obscure branch, of the great house of Chengiz. A branch which nevertheless ruled over a vast extent of country, from Dzungaria, on the Chinese frontier, to Afghánistán; had its eastern capital at Almálik, the modern Kuldja, north of the Thian Shan mountains; and its western at Bukhárá in Máwará-un-Nahr. Of this line Mr. Poole, in the VIth Volume of the British Museum Catalogue of Oriental coins, says the national collection possesses but three coins, struck by Danishmandjeh and Búyán Qulí: and I therefore propose, in the following list, to bring together all the numismatic evidence I have been able to obtain through the kindness of friends, who have so generously placed their coins at my disposal. I would take this opportunity to tender my best thanks to them, and also to point out that at present there is no dynastic list of rulers that can be considered accurate or complete, either in regard to the names of the Kháns, the extent of their appanages, or the length of their reigns, and that an extensive comparison of their monetary records affords one of the most hopeful means of obtaining further evidence. Every well verified name, date and mint that either private individual or public society can publish may prove a useful contribution towards the compilation of any history.

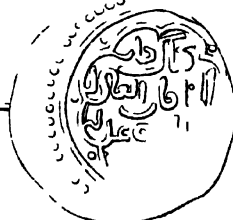
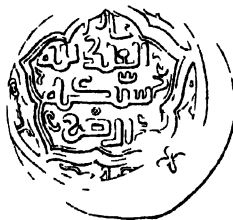
With the exception of Akhur all the mints noted in the present series are towns within the western division of the empire, Bukhárá, Samrqand, Kash, Soghd, Utrár, Tarmaz, and Badakhshán. What coinage may have issued from the eastern mints would probably be more likely to find its way to China than to India. On almost every coin the characteristic mark of the dynasty ☩, a Tibetan 'Chh' turned upside down, occupies a prominent position. This on half a dozen of Khalíls and Qazáns [Nos. 12 to 17] is replaced by one of a slightly varying character ☩, the lower half of which is a noticeable mark on the coinage of the Kháns of the Qrim, also descendants of Chengiz.



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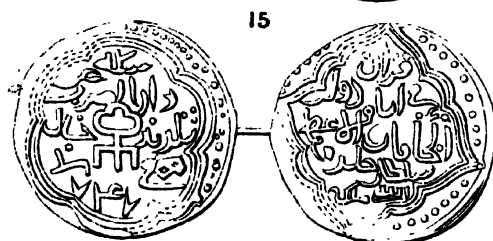
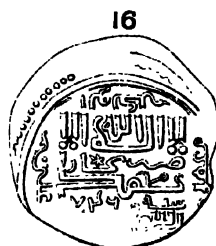
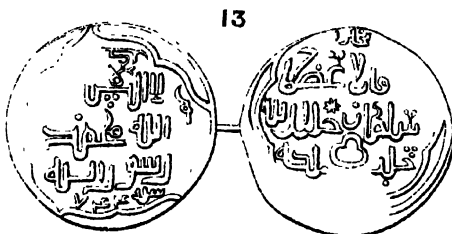
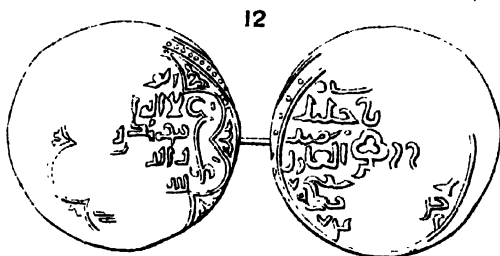
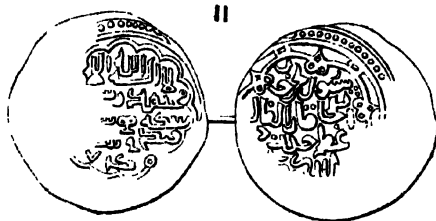
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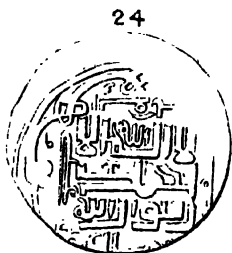
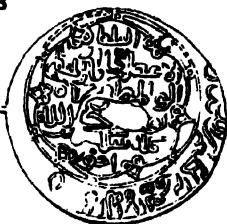




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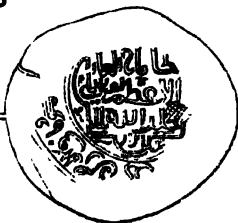




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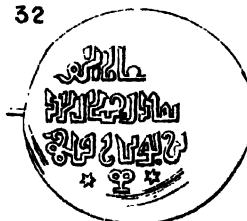
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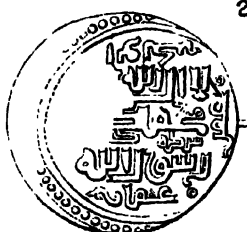
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The signification of this characteristic Chaghatái mark is a question of interest. According to the chronicle of Ssanang Setzen, who, himself a prince of a leading tribe, wrote a history of the "Eastern Mongols" in 1662, which is accepted as a high authority, the royal house originally sprung from that of Tibet: and Howorth in his history refers to a terminating Tibetan syllable written "*k'ri*" pronounced "*thi*," which means "throne," and is found in all the names of the ancient kings and princes of Thibet. Possibly Tibetan scholars may be able to throw some light on the  $\Psi$  "*chh*" in connection with the house of Chaghatái.

Most of the rulers describe themselves on their coins as "*Kháqán*", probably as not recognizing the sovereignty of the supreme Qáans of the line of Oktai, and several affix the name or title of "*Timúr*," as Yasún, *Khalíl*, Qazán, and in the lists Tuká, Duá, and Tughlaq, though on the first three coins, noted as struck at Bukhárá, neither word is used. The following list, taken from my paper in the R. A. S. Journal, is the best approximation I can offer of the line of Chaghatái Kháns, but it is very possible that some readers of this Journal may be able to supply from coins in their cabinets some additional means of verification and check. I need hardly say I shall be greatly obliged for any such information.

A. H. A. D.	
624—1227	I. Chaghatái.
639—1242	II. Qará Hulákú.
645—1247	III. Yassu Mangú.
650—1252	Qará Hulákú, restored.
650—1252	IV. Organah ( <i>Khátún</i> ) spent the 10 years of her reign probably at Almálik.
659—1261	V. Alghu.
C. 66 $\frac{1}{2}$ —126 $\frac{1}{2}$	VI. Mubárak Sháh, driven from the throne the same year as nominated.
C. 66 $\frac{1}{2}$ —126 $\frac{1}{2}$	VII. Borák.
668—1270	VIII. Nikpai } both nominated and killed within
670—1272	IX. Tuká } 3 or 4 years.
C. 672—1274	X. Duá.
706—1306	XI. Kunjuk.
708—1308	XII. Taliku, reigned but a few months.
709—1309	XIII. Kabák.
709—1309	XIV. Isseubuka, appears to figure under several names.
C. 718—1318	Kabák restored.

726—1325	XV.	Ilchikdai.
726—1325	XVI.	Tarmáshírín.
732—1332		Sanjar (? jointly or when Tarmáshírín was in India).
734—1334	XVII.	Jinkshí.
739—1338	XVIII.	Yasún.
C. 741—1340	XIX.	'Alí Sultán.
„ 742—1341	XX.	Buzun.
„ 743—1343	XXI.	Khalíl.
„ 744—1344	(? XXII.	Muhammad Pulád, a doubtful prince.)
„ 745—1344	XXIII.	Qazán.
747—1346	XXIV.	Danishmandjeh.
749—1348	XXV.	Búyán Qulí.
760—1359	XXVI.	Tímúr Sháh.
		(?) Buáyán.
761—1360	XXVII.	Tughlaq Timúr (nominal).
765—1363	XXVIII.	Ilyás Khwája.
767—1365	XXIX.	'Adil Khán.
767—1365	XXX.	Kábul Sháh.

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771—1369	Snyurghatmish.	} nominal, under Tímúr.
790—1389	Mahmúd.	

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## LIST OF COINS OBSERVED.\*

QARA HULAKU, son of Mutahkan. Mutukan of the lists and grandson of Chaghatái. According to Shaw **اوغلى** means a male child in Eastern Turkistan.

Baldah Bukhárá, xxi H. Fræhn's Recensio.

..س.د.. م ببلده بجا ... حدي ... قرا هلاكو مونه كن اوغلى \*

ALGHU. Algu of the lists, son of Baider and also grandson of Chaghatái.

Bukhárá, 660 H. Fræhn's Recensio.

ضرب هذا الدرهم بالبلدة ال... سنة ستين وستمائة سكاه | بخارا  
( الفاخرة ) ( الغو بایدار اوغلي )

\* In the above list, besides private collections, I have referred to Fræhn's Recensio, the British Museum Catalogue, and M. Ticsenhausen's notice of M. le Count Stronganoff's collections.

No. 1. *Æ.* 1·55. Bukh<sup>h</sup>ará, 660 H. Mr. L. White King.

In centre سكۀ | بخارا

Both margins alike ضرب... هذا الدرهم بالبلدة الفاخرة سنة ستين و ستمائة

KABAK. The Guebek of D' Ohsson. The mint Madinatu-l-rijál (the city of the people) Tarmaz is the Tirmid of the maps north of the Oxus.

No. 2. *R.* 1·10; 119·5 grains. Madinatu-l-rijál Tarmaz. My cabinet

لا اله الا... | محمد رسـ... | الله سـ...

مدينة الرجال | ترمذ

... | عثمان | ...

[عراسـ] | اعظم مالک | م کباب

خان | ... الله ملكه

No. 3. *R.* 1·3; 119 grains.

بخارا | الملك لله | سكۀ | ... مدار الضرب

... | ... | ... | ... | ... | ... | ... | ...

Bukh<sup>h</sup>ará, 71x H. My cabinet.

کباب خان | الخاقان العادل

... | عدله | ...

No. 4. *R.* ·8; 19 grains.

کبابی | الخاقان | العادل | خان

Bukh<sup>h</sup>ará, 722 H. Mr. Rodgers.

سكۀ | بخا | را | ...

Ditto. ·75, 20 grains. Bukh<sup>h</sup>ará, 723, 725 H.

My cabinet.

Ditto. Ditto; 722, 723, 724, 725 H. Count Stronganoff.

Ditto. Samrqand, 725 H.

Ditto.

No. 5. *R.* ·8; 29 grains. Madí [nat] Tarmaz, 71x H. My cabinet.

الله | لا اله الا | محمد رسول | الله

... | ... | ... | ...

سكۀ | مد... | ترمذ

... [سكۀ] | ...

#### TARMAŠH'RYN.\*

No. 6. *R.* ·75; 18 to 22 grains. Utrár, 733 and 734 H. Mr. L. White King.

لا اله الا | لله وحده لا | شريك

له ملكه | اترار ۷۳۳

علا الدين | توما شيرين | خان

ق خلد | الله ملكه

Ditto. *R.* ·8. Madinatu-l-rijál Tarmaz. Count Stronganoff.

... الملك | لا اله الا | لا شريك | ... الله

مكة مدينة الرجال ترمذ

\* Regarding mint Utrár see J. R. A. S., Vol. XX, Part I, page 86.

Ditto. R. Samrqand, 726 H.

Ditto.

لا بهارة | ..... | الا بالعدل

سكه | سمر قند | ۷۲۶

## SANJAR.

No. 7. R. 1·15; 116 grains. Samrqand, 781 and 732 H. My cabinet.

الله

لا اله الا الله | محمد رسول الله |

سنجر خان | ساسد...ون بن

صلى عليه وسلم

| ضرب في ايام دولة السلطان

ضرب سكه سمر | قند

| العادل علا الدنيا والدين

في قند سنة | ۷۳۱

| خلد الله ملكه

## JANKSHI.

No. 8. R. 7; 19 grains. Balahdah-Utrár, xx6. My cabinet.

سكه | ...بلده قند اترار | سنة ست | سان... جنكشي | خاقان عا | ...ن زيد | عدله...

Ditto. Utrár, 736, 737, 739 H Count Stronganoff.

Ditto. Bald Utrár 73x.

Ditto.

السلطان | الاعظم | خلد الله | ملكه

سكه | بلد قند اترار | سنة ۳ | ۷

## YASUN.

No. 9. R. 1·2; 120·5 grains. Madínatu-l-rijál Tarmaz. My cabinet.

...طان | يسون تيمور | الخاقان الا | ...ملكه ... | الرجال | قند...مذ

Ditto. R. 1·2, 122·5 grains.

Ditto. Mrs. Stoker.

سكه...يد... | الرجال قند

...ون تيمور... | ...قان العا |

... | ... | تر...

...خلد... | ملكه

No. 10. R. 1·05; 123·5 grains.

Ditto. Mrs. Stoker.

لا اله الا الله | محمد رسول الله | الله سكه

...ن...مور | الخاقان الاعظم | بهادر خان

| ترمذ مدينة الرجال

| خلد الله ملكه | ...قند...

... | ... | ... | ابوبكر

No. 11. R. 1·1; 114 grains. [Samr]qand, 740 H. Mr. L. White King.

لا اله الا الله | محمد رسو... | سكه

يسون تيمور خان | الخاقان العادل

سمر... | قند في... | ۷۴۵

...عظم خلد... | ملكه

## KHALIL.

No. 12. *AR.* 1·25; 119 grains. [Samr]qand, 74x H. My cabinet.  
 ... شمس | ... ن خليل قند | ... ان ...  
 لاله ... | محمد ... | لاله ... | ...  
 العادل ... خلد | ... [ملكه] سنه ... | ...  
 ابو ... | ... | ... | ...

No. 13. *AR.* 1·15; 121 grains. Bukhárá, 744 H. Mrs. Stoker.  
 بخارا | ... قان الاعظم | سلطان خليل  
 لاله ... | الله محمد | رسول الله  
 سنه ٧٤٤ | .. بكر | ... مر ...

No. 14. *AR.* 1·15; 123·5 grains. Bukhárá, 744 H. Mr. L. White King.  
 السلطان العادل | خليل تيمور | ...  
 لاله الا | الله محمد | رسول الله  
 سكه | ... | ... | بخارا  
 ٧٤٤ | في التا ... | ... | ...  
 ... | ... | ... | ...

## QAZAN.

No. 15. *AR.* 1·2; 116 grains. Bald-i-Badakhshán, 747 H. My cabinet.  
 قزان | في ايام دولة | الخاقان الاعظم سكه | دارالضرب ... | بلد بد ...  
 سلطان خلد | الله مله  
 في سنه ٧٤٧

Ditto. *AR.* 1·15, 123 grains. ditto. Without date. Mrs. Stoker.

No. 16. *AR.* 1·20; 123 grains. Bukhárá, 746 H. Mr. L. White King.  
 الرحمن | المظفر على اعداي | .. لسلطان  
 العادل ابوالمظفر | ازان ... سلطان | مله ملكه  
 ... | ست و | اربعين | ...  
 لاله الا الله | محمد | رسول ...  
 ضرب بخارا | سنه ٧٤٦  
 ابو بكر | عمر | ... | على

No. 17. *AR.* 1·25; 118 grains. Bukhárá, 744 H. My cabinet.  
 السلطان ... | فازان تيمور خان |  
 خلد الله ... ملكه  
 سكه | بخارا | بخارا | بخارا  
 ٧٤٤ | ... | ... | سنه |  
 اربع | و اربعين | سبعمائه

## DANISHMANDJEH.

*AR.* 1·25, 115; grains. Bukhárá, 747 H. British Museum.  
 خاقان العادل دانشمند | ... خلد الله ملكه  
 لاله الا الله | محمد | رسول الله  
 ابو بكر | عمر | عثمان | على  
 سبع ... سبعمائه سنه اربعين | بخارا



## BUYÁN QULÍ.

No. 18. *R.* 1·2; 111 grains. *Akhúr*, x57 H. \*My cabinet.

السلطان | الاعظم خاقان المعظم | ابوالمظفر  
 خان | بو .... خلد | الله  
 ملكه سكه... ب | اخور  
 لاله الا هو العزيز الحكيم... ل...  
 و الله الغني | و انتم الفقرا | لاله  
 ... الله | محمد رسول الله  
 ..... | عمر | ... | .. | على

No. 19. *R.* 1·2; 119 5 grains. Samrqand. Mr. Rodgers.

السلطان العا | دل بويان قلے | خلد الله ملكه  
 لاله الا الله | محمد | رسول الله  
 ضرب | سمرقند  
 ابوبكر | عمر... | عثمان | على

No. 20. *R.* 1·25; 118 grains. Samrqand, 7xx. Dr. Stulpnagel.

الملك لله | العدل الملك بوا |  
 الخاقان | العادل | بويان قلي خان  
 خلد ملكه  
 لاله الا الله | محمد | رسول الله | سكه—  
 سمرقند | صلى | عليه | رمضان | في سنه  
 .. | . | ... | سبعمائة

No. 21. *R.* 1·55; 116 grains. Samrqand, 755·4 H. My cabinet.

السلطان العا | دل بويان قلے | خلد  
 الله... لكه \* خان \* | .....  
 سنه خمس و خمسين | سبعمائة  
 لاله الا الله محمد | رسول  
 الله | سكه | سمرقند  
 في سنه [احد] ... |  
 ..... | ..... | .....

No. 22. *R.* 1·25; 120 grains. Samrqand, 754 H. My cabinet.


السلطان الاعظم | بويان... خان  
 ... | ملكه | ..... | سمرقند  
 لاله... الا الله | محمد | رسول الله |  
 ابوبكر ... | عمر | عثمان | على ..... | في  
 شهر ... | سنه | اربع | و خمس | وسبعمائة

No. 22 A. *R.* 1·2; 122 grains. Samrqand, 7x5 H. My cabinet.

الرحمن | المظفر على اعداي | السلطان  
 العادل | بويان قلي خان زيد عدد |  
 ..... | ..... | ... خمس | .....  
 ..... | سبعمائة


No. 23. *R.* 1·25; 15 grains. Samrqand, 755 H. My cabinet.


السلطان العادل | بويان قلي  
 خان | خلد الله ملكه  
 في شهر | ..... | خمس  
 و خمسين | سبعمائة  
 لاله الا الله | محمد | رسول  
 الله | سنه | ٧٥٥  
 سكه | سمرقند... | ابوبكر  
 عمر | ..... |


No. 24. *AR.* 1·2; 124 grains. Utrár, 752 H. My cabinet.  
 العادل | بويان قلي خان | خلد الله ملكه |   
 ..... | اترار | ٧٥٢ | .....


No. 25. *AR.* 1·25; 118 grains. Utrár. My cabinet.  
 الخاقان العادل | الاعظم بويان قاي  
 | خلد الله ملكه | ... | اترار |  
 ..... سموات و ما فى الارض .....  
 ..... حفظهما وهو العلي .....


Ditto. Samr-Utrár. My cabinet.  
 ا قان العادل | الاعظم بويان | خلد الله  
 ملكه | سكه سمر اترار | زيد عمر  
 ..... | عمر | علي

No. 26. *AR.* 1·25; 122 grains. Bukhárá, 756 H. My cabinet.  
 ... سلطان العادل | ... ان قاي خان خلد... | لا | اله | الا | ... | محمد |  
 له ملكه  و زيد | الله عمره سكه | بخارا | رسو | ل الله | بخارا | ٧٥٦  
 ..... | عمر | ابوبكر | .....

No. 27. *AR.* 1·25; 123 grains. Bukhárá. My cabinet.  
 ضرب—بخارا  
 لسلطان العادل | بويان قلي خان | خلد الله  
 ملكه | سكه | بخارا

No. 28. *AR.* 1·25; 122 grains. Kash, 753—4 H. My cabinet.  
 السلطان العا | دل بويان قلي | خلد الله  
 ملكه...  
 في شهر | ..... | ..... | 

No. 29. *AR.* 1·25; 126 grains. Kash. My cabinet.  
 السد | بويان قلي بها... خلد | سكه | كش...  
 الله ملكه | ... | 

Ditto. Soghd. Count Stronganoff.  
 خان | الخاقان | العد | ... | العادل  
 بويان... | خلد  الله


BU'YÁN. ? Seldúz. After Búyán Qulí was murdered in 760 H. and the puppet Timúr Sháh set up, there was something like general anarchy, various Amírs seizing provinces and asserting their independence. The whole of Máwará-un-Nahr was seized by an Amír whose

name is generally written Bayán Seldúz سلطان بایان سلدوز, spelled "Biaún Suldoze" in White's *Institutes of Timur*. He seems to have governed in a way, though a dissipated hard-drinking Amír, and to have been put to death by Tughlaq Tímúr Khán (ruling in Eastern Turkistan) circa 764 H. It seems possible that the two following coins may be his.

No. 30. AR. 1.25; 121 grains. Madínatu-l-rijál Tarmaz, 764 H. My cabinet.

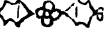
العدل الملك |  | بویان ۷۶۴ | سکه | مدینه ؟ الرجال | ترمذ

Ditto. ? Bukhárá, 7xx H. Mr. L. White King.

...عدل الملك |  | بویان | سکه | بدار ؟ ضرب | ... را 

Doubtful coins.

AR. 9. (? Duá.) Bada<sup>kh</sup>shán, 69(4) H. Count Stronganoff.  
 سکه بدخشان سنه اربع و تسعين | لاله الا | الله محمد | رسول الله  
 و تسعمائة

No. 31. AR. 1.2; 120 grains. Mahmu[dábád], x27 H. Mr. Rodgers.  
 ... [عبارة] مالک ... |  | [عيلة] | ۲۷ | سکه ... | محمود ؟

No. 32. AR 1.2; 124 grains. Samrqand, 753 H. Mr. L. W. King.

...طان ابو | لعدل [ناصر الد] | بن بویان قلی | \*؟؟\* | سکه سمرقند | ۷۵۳

Ditto. Without mint, 754 H.

Ditto.

In these two coins and in some others, Búyán Qulí calls himself Násiru-d-dín.

KATLAGH KHWAJA, the son of Duá, who with his father invaded India, and appears to have been at Jalandhar 696, as far as Delhi 697-8, and Lahore 701 H. (See Zia-ud-din Barni, and D'Ohsson's account.) His copper coins, like the two following, are not uncommon in India.

No. 33. AE. .6; 53 grains.

...سہ... حضرت... | ...

ضرب لو ... | ؟

No. 34. AE. .6; 52 grains.

[قتلغ] | خرو... | سد

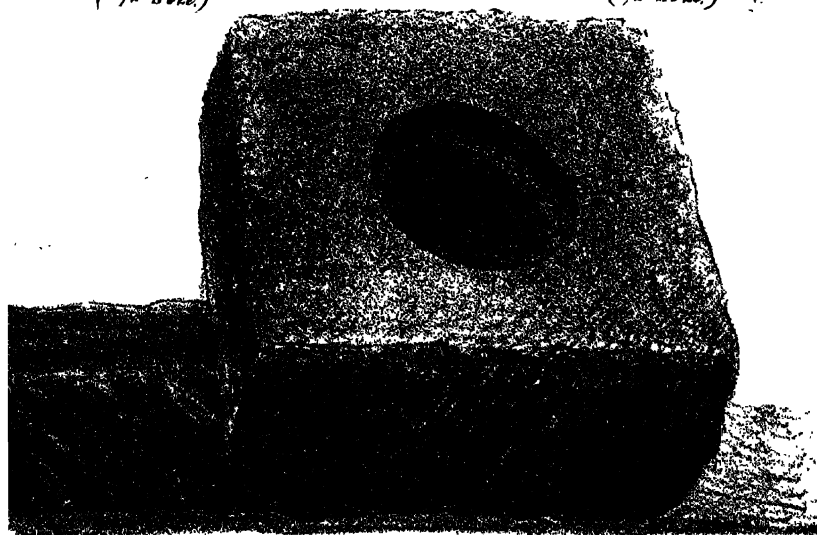
ضرب... سلور | ؟



CHIPS OF BROKEN POT.  
( $\frac{1}{2}$  Size)



LID OF THE STONE COFFIN.  
( $\frac{1}{2}$  Size)



STONE COFFIN & UPPER BLOCK SEEN BEHIND. ( $\frac{1}{4}$  Size)



# JOURNAL

OF THE

## ASIATIC SOCIETY OF BENGAL.



Part I.—HISTORY LITERATURE, &c.

No. II.—1891.

*Report on the Boria or Lakha Medi Stûpa near Junagadh.*—By HENRY COUSENS, M. R. A. S., Archæological Surveyor of Western India.

(With a Plate.)

On the 27th of January, 1889, I received a demi-official from the Director-General, Archæological Survey, enclosing a cutting from the *Morning Post* in which was given a short account of the opening of a *stûpa* near Junagadh, Kathiawad, by Mr. J. M. Campbell, C. S., directing me to take immediate steps to ascertain what was being done. On the same day I wrote to Rao Bahadur Haridas Viharidas, Divan of Junagadh, and in reply was told that Mr. Campbell had, during the Christmas holidays, commenced the excavation of the *stûpa* in question, and had left instructions with them for its continuance. I then wrote to Mr. Campbell (letter No. 12 of 31st January 1889) asking him what had been done, and what was still doing, and received from him a statement of all that had been done up to that time. In his note accompanying it, he said that, should anything be found, he would be immediately informed, and would try to return to Junagadh for a few days. On the night of the 15th instant, I received a telegram from the Assistant Divan of Junagadh from which I understood that a 'find' had been made. The Assistant Divan, Mr. Ardesir, wrote me at the same time, but the letter did not reach me then, as I started early next day. At Dhola Junction I met Mr. Campbell, and we went together to Junagadh. The next morning we went out to the *stûpa*. But before describing the 'find,' I will try and describe the position and surrounding of the *stûpa*.

At the foot of the southern slopes of Girnar whose precipitous cliffs rise a short distance to the east of Junagaḍh, is a small secluded valley—an amphitheatre among the hills—almost entirely surrounded by the latter. It is about six miles from Junagaḍh, and the only path to it leads for some distance along the course of the river, past the celebrated Ásoka Rock, and crossing an intervening spur, debouches at once into it. It is thickly wooded, and the bush and scrub, with a good sprinkling of larger trees, climb the hill sides to near their summits. At every turn in the path, lovely glimpses of the surrounding scenery are seen through the foliage, and many a charming view is further enhanced by its vivid reflection in an occasional pool in the watercourses crossed in the way. The great rugged sides of Girnar, with its everlasting rocks, kissed by the lingering rays of the rosy sunset, and begirdled with a cloak of varied tinted foliage, now fading into the softest pearly greys, is a picture one loves to linger before. Around us, beside this old patriarch among hills, we have in the south-east the heights of Gadesing, crowned by its ruined fort, on the south-west Dátar-no-dongar, with the hills of Mákhán Kundi, Taktakgiyo, Szadiári, and Pavandhoda between, and the low pass on the eastern slopes of Girnar known as Súrya-kundki-godi. In the middle of this beautiful valley, then, thus cut off from the outside world, upon a rocky knoll, stands the great mound known as the Boria *Stúpa* or the Lakha Medi (the abode of Lakha). The ground on every side between it and the western edge of the valley is strewn with fragments of bricks, and here and there are small mounds which look much like the remains of little *stúpas*. Directly eastward of the big *stúpa*, and on the eastern edge of the valley, is the small temple of Bor Deví, so called from the Bor trees which surround it.

On our arrival at the *stúpa* we found that a relic casket had been unearthed. The digging that led to its discovery is described in Mr. Campbell's notes attached, from which it would appear that the depth of the casket from the summit of the mound was 39 feet. During the excavation the top of the mound had been cut off to a depth of 22 feet, and a trench 20 feet wide at the top had been driven from the east straight into the centre. The sides and floor of the cutting shew, that the whole *stúpa* was built of close horizontal layers of good brickwork in herring-bone bond, and it is a solid compact mass. The bricks are of the old Buddhist type, measuring 18" × 15" × 3". Whatever the state of the upper portion, which has been cleared away, may have been, the lower part now standing is solid enough to allow a perpendicular cutting to be carried down without fear of the sides falling in.

During the excavation various slabs and fragments of sculptured stone (Junagaḍh freestone) were met with, most of them having been

found about the vertical axis of the mound. They were numbered as found, but owing to no plans or sections having been plotted as the work progressed, there was some little doubt as to the positions of some few fragments. The two great heavy rail slabs were no doubt placed in the positions in which they were found for the purpose of the better securing the relics from any burrowing thief. The others were probably put in without any special purpose.

Before describing these fragments it will be as well to revert to the relics. See Plate V. On our arrival at the mound on Monday, the 18th February, we entered the trench and found the stone coffer, with its lid upon it, standing on one side (west) of its original bed. As far as could be seen, it had been placed in the vertical axis of the mound, and, from measurements taken by me, and the statement that it was at a depth of 39 feet from the original top, I conclude that it occupied a position in the centre of that axis. On finding the box, Mr. Ardesir had it lifted to one side to see if there was anything beneath it, but he kept its bed undisturbed so that we could see how it was placed. From the discovery until we arrived a day or two had elapsed, during which time the coffer had been left standing in the trench under a guard, but had not been sealed or otherwise made fast. This outer receptacle consists of two blocks of white free stone, one upon the other, the upper serving as a covering to the lower. The block had been placed, so far as I could see by the marking of the bed, with its sides facing the cardinal points. Upon lifting off the upper slab we found a small circular well in the upper side of the lower stone, closed by a thin circular slab which rested upon a shoulder inside round the top of the well. On lifting out this little cover, whose top was flush with the top of the slab, we found inside a small stone pot with lid. The shape of the lower part of this is that of a shallow bowl, while the upper, or lid, was like an inverted saucer with a lip on its underside. This pot was very nearly as big round as the well in which it was placed, and it was with some little difficulty got out. The bowl or the lower part of the pot is perfectly plain, but the top has, by way of ornament six concentric grooved circles. The material out of which it is made is a dull red claystone, and the whole has been turned very neatly upon the lathe. This is evident from the circles, where the tool in its progress round has very slightly chipped or serrated the edge of the circles. A curious thing about this pot, and which will be noticed again presently, is that the lid does not fit the bowl, being too big for it, its lip overlapping and resting on the inner edge of the bowl instead of dropping into it. Within the well, surrounding this pot, was found a small quantity of gritty powder.

In the stone pot was found a little copper pot in two parts like



the last—bowl and lid. Thus far had the pot been opened by Mr Ardesir before our arrival. The copper pot being encrusted with green verdigris was not so easily opened, and the further opening of the vessels was entrusted to me. To open the copper pot, I had to insert the blade of my penknife between the lid and the bowl, and by gentle leverage force the former off. The general shape of the copper pot is that of the stone one, being slightly rounder. But it has an addition of a little drum-like protuberance forming a kind of handle to the lid. When the copper pot was opened a silver pot of the same shape was found within, while underneath it, and between it and the sides of the copper pot, was a dry brittle substance covered with verdigris. This, on close inspection, has the appearance of compressed vegetable matter, bearing the impress of the silver pot on it. It looks as if some green (moist) grass-like vegetable had been put in, and the silver box added and pressed down upon it. Its moisture had greatly corroded the inside of the copper vessel up to a line above the junction of the lid. Beyond this, the interior of the dome of the lid was not corroded, being apparently protected by the intervening silver box, and this part had a purplish metallic sheen which is probably the result of fire when heating out and shaping the lid. The corrosion had eaten a considerable hole in one side of the bottom of the bowl.

The silver box was quite bright. The only difference between this and the copper one being in the shape of the knob on the top which has a narrower waist at its junction with the top of the dome of the lid. This, on being opened, revealed a bright little gold box. Between the two was a small quantity of very light knobbly brown stuff which on close examination and under a low power microscope appeared to have a distinctly fibrous texture. To me it appeared to be a mouldy or fungus vegetable matter.

Great interest and curiosity now centred round the opening of the gold box, and the lid was removed amidst much speculation as to its contents. Its shape differed from the others only in the shape of the knob on the lid which was here conical. In the box we found the relic and a few grains of coaly grit, accompanied by the usual five offerings, in this case comprising an aquamarine (?) bead, a ruby, a sapphire, an emerald, and a small piece of dry twig or white coral with a smaller chip of the same. The relic upon close examination seems to be a small chip of stone that has been under the action of fire. It is a flake about  $\frac{3}{4}$  of an inch long by  $\frac{1}{4}$  of an inch broad, of a dull yellowish drab colour with darker smoky stains. Its surface is cracked all over as if by fire. Under the microscope the surface appears to be covered with fine grains of sand of various hues and dimensions. A lower power shews

the surface as blocks of rock with the rifts or fissures (the cracks) filled with gravel. It is most certainly *not* bone, nor does it appear to be burnt clay, unless it has been burnt into hard stone ware. The gritty substance under the microscope looks like lumps of coal of various sizes, and to the naked eye as a few grains of different sized gunpowder. The bead which is the largest jewel, is in cross section triangular with rounded corners, one side being much longer than the other two, which, themselves, are unequal. The bead, in its length, has thus three faces. The hole has been drilled from both ends, which is evident from the meeting in the centre not being quite true. It is transparent, with a slightly, but decided, green tinge, and Mr. Campbell thinks it an aquamarine. It may be crystal. The ruby, which is ruby-coloured by reflected light, is of the colour of strong tea by transmitted light. It is in the shape of a very flat cone, the diameter of its base being about  $\frac{3}{16}$  of an inch. The sapphire is a deep blue by reflected, but a lighter blue by transmitted light, while the emerald is light opaque green. These two stones are smaller than the ruby, the emerald being the smallest. Now we come to the last article, which has all the appearance of a piece of dried twig, though perhaps a trifle heavy for such. It is about  $\frac{5}{8}$  inch long and nearly  $\frac{1}{4}$  inch in diameter. The outside is covered with fine parallel lines or scoring, running with the length of the substance, and on it are one or two eyes where leaves or small branches may have been attached. It is of an uniform grey tint. The fractured ends or sections do not, however, shew any woody texture, but is more solid looking. In the five offerings made to images, and at the consecration of Hindu temples, the coral always forms a fifth with jewels, but then it is generally the red coral. It is not unlikely that this may be a piece of coral too, but of the white kind. The nature of the bead requires a professional opinion to decide. The usual five offerings in Hindu shrines are—a diamond, a ruby, an emerald, a pearl, and a piece of coral.

The relic boxes were carefully examined, but no trace of inscription or of single letters could be found, nor has any coin been discovered. We are thus still without any clue to the age of the stūpa, unless we get it in the fragments of sculptured stones which may yet be excavated. On the 20th the relic boxes and the contents of the small gold box were photographed full size.

The excavation is still being continued, and when we left the mound on the evening of the 19th, a well had been sunk in the brick work to a depth of 8 feet below the centre of the position, where the coffer stood; but without anything more being found.

The sculptured stones that had been found are themselves full of interest, and if the remaining portions of the structure of which these form

part can be discovered, the trouble and expense in getting at them will be amply repaid. The top member of the Tee or triple umbrella is a huge heavy slab one foot two inches thick. The edges round are broken away, but one image mortise remains at one corner, 3 feet 4 inches from the centre. The centre of the slab is pierced with a large round hole, 1 foot  $3\frac{1}{2}$  inches in diameter, to receive the stem of the umbrella. Three-fourths of the entire rim of the great umbrella were found, and they all piece together remarkably well, and give a diameter of 10 feet and a thickness of 1 foot. Four fragments of the four supporting images (one of each) have also been found, and the tenons under their feet correspond with the mortise in the top of the Tee. In the lower edge of the umbrella rim are the corresponding mortises to receive the tops of the images. The underside of the umbrella is slightly hollowed out. The whole was originally in one piece, but as yet the central parts and the remaining fragments of the rim have not been found. Nearly half the collar, however, with portions of the two upper ones, of different thickness, have been excavated. The holes in these decrease in size. Portion of a smaller figure, probably from the second tier, has been recovered. In the top of the big umbrella are four mortises immediately above those below, but near the centre, for the feet of these upper images. In the edge of the umbrella small holes are drilled through half way, between the images and about  $\frac{5}{8}$  inch diameter, apparently intended for hangings or the sticks of small flags. There are many other fragments and slabs whose original use cannot as yet be definitely determined, but in addition to these are the fragments of two lengths of rail slab, 8 feet 3 inches by 3 feet  $5\frac{1}{2}$  inches. These have long tongues at either end to fit into long mortises in some supports not yet found. The surface is carved into uprights with three bands of rail running through them. On the upright struts are incised central circles with a half circle at top and bottom. The length of these slabs is the length of a side of the original polygonal railing round a *stúpa* or structural dagoba.

The question which now requires solution is, whether the triple umbrella was an erection over a previous *stúpa* or over a structural dagoba. That it was never erected over the present *stúpa* is self-evident from the positions in which the fragments were found. If a larger *stúpa* existed on this spot, it is very unlikely that it would have been pulled down and rebuilt. It would have been repaired if necessary or an outer casing added. It is my opinion that a structural dagoba existed probably on this spot *before* the *stúpa*, and the triple umbrella being so top-heavy fell and was smashed as we find it; and in this was enshrined the present relics. Finding how unstable this arrange-

ment was, the Buddhist determined to build the present *stúpa*, and the fragments of the old dagoba, which had to a certain extent become sanctified by its use as a relic receptacle, were buried in the mound. I should thus not be surprised, if the bulk of this original structure be found at the ground level, being thrown in to help to get the required height for the relic coffer.

It has been decided to carry on the excavation to the rock ; and I estimate that there are 35 to 40 feet of brick work between the position of the coffer and the foundation. I have advised that a well be continued down through the centre, a sloping approach being made to it from the east along the present cutting. Then, if necessary, the cutting east and west might be carried straight through the mound down to the foundation. If nothing is found, then it will be needless to demolish the mound in the chance of finding anything in the two halves. If, on the contrary, my suppositions are correct, and the remains of some structural dagoba be found scattered through the mound then nothing is left for it but to clear away the whole.

At a point in the mound at about 4 feet from the coffer, and on the same level, was found a handful of broken chips. These were the fragments of a pot of exactly the same material as the stone pot containing the relics, and on piecing some of the fragments around the lip of the cover of the latter they were found to lie evenly to it and to have exactly the same curve. I have already mentioned the little trouble we had in getting the stone-pot out of the well, which was a good deal deeper than it, there being hardly enough room round about it to get the fingers in. The inference I draw from this is, that the original bowl, of which the present lid was its cover, is now represented by these fragments. The accident probably happened thus. After enclosing the copper box within the stone pot, the latter was being let down into the well, when, from the small diameter of the latter the priest's fingers slipped from the bowl to the lid. The bowl fell into the well and got broken while the lid remained in his fingers. The fragments were then taken out and cast aside, and a new bowl obtained which did not quite fit the lid. The immense pressure of the mass of brick work above reduced the fragments to chips as we find them. But the amount of these is quite sufficient to build up a complete bowl as large as the whole one.

It is curious that no heads of images have as yet been found.

I have not been able to revisit the *stúpa* since my first visit, but have been informed that nothing of any consequence was found upon further excavation.

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*Notes on some Kolarian Tribes. No. II.\*—By W. H. P. DRIVER.*  
*The Koroas.*

*Habitat.*—Koroas are to be found scattered over various parts of Chutiyá Nágpur, from Palamu in the north down to the most south-western of the Native States. They are in various stages of civilisation, from the Birhor-Koroa of the jungles to the cultivator on the plains who prefers to call himself a 'Kisán.'

In Palamu they call themselves Korea-Munḍas rather than Koroas, and in Sirguja and Jaspur they like to be called Paharias, the name Koroa being looked upon as a term of reproach.

*Language.*—As usual when branches of any tribe become isolated, the Koroas in different districts have various dialects, and the following are a few samples of differences between the Baroi and Manipat Koroas.

<i>English.</i>	<i>Baroi Koroa.</i>	<i>Manipat-Koroa.</i>
White ant	... Bunumku	... Santi.
Bear	... Nunikmai	... Bana.
Blood	... Chala	... Balgi.
Bone	... Kod	... Jaug.
Body	... Harom	... Sindir.
Cloth	... Pagi	... Souhe
Hair	... Silik	... Ub.
Thigh	... Bul	... Tob.
Lie	... Lobra	... Buri.
Mouth	... Totna	... Ah.
Rice (cooked)	... Kode	... Jow.
Word	... Balda	... Barra.
There	... Inandera	... Hona.
Far	... Sanging	... Langka.
That	... Man	... Mader.

*Traditional and Conjectural History.*—The Koroas like other wild tribes know little of their own history, but they have traditions about the Mahádeo Hills, and the same fiction as the Asurs about their origin, viz., that they are sprung from scarecrows. Their traditions also connect them in a distant way with the Korkus, Kurs, Saonts, Asurs and Beonarias.

When these aborigenes were driven south by the Aryans they appear to have been generally known amongst themselves as Kora, their word for man. The more eastern branch of the Kolarian race was in those

\* [Continued from Vol. LVII, p. 7, of 1888. ED.]

days evidently known as Horo. To this day the members of the eastern branch can be distinguished by the use of H, where those of the western branch use the letter K. From the remains of brick and stone temples, it would appear that in ancient times small communities of Aryans used to settle amongst these aboriginal tribes, perhaps at first as conquerors, but afterwards on a more familiar footing, until with the lapse of time they became absorbed in the Kolarian population. Traces of mixed blood are plain enough amongst the population of this part of the country at the present day.

*Authentic history.*—The earliest historical fact we have in connection with the Koroas is, that in 1818 A. D., when Sirguja and Jashpur were ceded to the British by Appa Sahib, the Koroas, under a chief named Manawar Sing, were at war with the Rájá of Sirguja. Then in 1857 the Koroas of Sirguja went into open rebellion against the British Government, and one of their chiefs Dharam Sing was hanged after we regained the country. Again in the beginning of 1884 this same tribe (probably owing to scarcity) took to highway robbery and murder. The ring-leader on this occasion was one Katra, and he and three others, named Bandhan, Jitu and Ledra, were tried and hanged at Ranchi. Of the others implicated, two more, Dunde and Punea, were transported, and another Bandan received five years' imprisonment. It is said that in years when the hill Koroas crops were scarce, they used to pay a visit to the Rájá in a large body, armed with their terrible bows, arrows and battle-axes. The Rájá in those days was only too glad to get rid of them by ordering a general subscription for their benefit. Alas! now, gone are the days of "the good old rule, the simple plan," and the British are here to maintain law and order.

*Divisions.*—The Koroas are divided into several sub-tribes, the Pahariá or Bor-koroas, the Birinjia koroas, the Birhor-koroas, the Koraka-koroas, and the Koria-mundas. All live amongst the hills and jungles and speak dialects of the Kolarian language. The Dand-koroas or Dih-koroas and the Agaria-koroas live on the low lands, and speak only a dialect of Hindí.

*Food.*—In the way of food, Koroas of the hills can eat goats, pigs, fowls, cows and buffaloes, but not snakes, or frogs or lizards. Only Birhor-koroas can eat monkeys. They all eat various jungle products, and many of them know of the medicinal properties of herbs, roots &c., to be found in their jungles. The following are the names of a few such medicines, *viz.*, Churaphal, Gethi, Bhournali, Barkajeri, Harraphal, &c.

*Religion.*—Koroas employ three kinds of priests, who must, however, all be Koroas. The Pahan-Baiga is the head priest, the 'Pujár' is his

assistant, and the Dewar is the consulting priest. They also have Ojhas, Dains and Motis, i. e., wizards, witches, and sorcerers, who deal with various kinds of spirits, and work on the superstitions of the people. The mediumistic powers of such people are supposed to be innate. Koroas worship the sun. Once a year in the month of November, the religious-minded Koroa goes out by himself, before dawn, to meet the rising sun, and without the assistance of a priest, he offers up a sacrifice of a white cock, upon an open field. The priests offer their sacrifices under the Sarna of sal trees, which is to be found near every village. Darha and Darhin are worshipped in the Sarna, and the hinduised Koroas of the plains worship Kálí in a temple. A red or spotted cock is offered to Darha and a red hen to Darhin, and to these are added a little 'Handia' or native rice beer, which the soul of the Koroa loves. There is also a Paht Deota or hill god who eats red cocks. On occasions of distress the Baiga offers an oblation of milk to Kálí. The goodwill of 'Arha Burhi' (their ancestors) is invoked on any occasions of moment.

*Festivals.*—At the 'Phagna' festival, in March, a 'simal' (cotton tree) branch is planted on the east side of the village, straw is tied on the top of it, and then set fire to. After drinking and dancing round this, the Baiga cuts off the top with a 'balua' (battle-axe). He then takes and sticks it over his own door, and offers a sacrifice of a spotted fowl, and some bread made of rice flour. This festival lasts for two days, and they dance the 'Tharia' and 'Jhumta. The 'Sarhul' festival, in April, lasts four days, a red cock and hen are sacrificed and they dance the Jhumta and Chandrani. Once a year, in the month of July, the Pahan sacrifices to Kálí a 'khassi,' goat which the whole village subscribes for. At the 'Nowa' or first crop festival in September, the dances are Chandrani and Desoari, and only a hen is sacrificed by the Pahan, but after the harvesting is over, every Koroa household offers a thanksgiving sacrifice of a red and white hen to ancestors. The 'Sohorai' or cow festival, in September, lasts four days, and two red cocks are the proper sacrifice on this occasion. At the 'Dassain,' in October, the Diwan of Khuria sacrifices a 'khassi' goat. The Karma festival, in October, lasts two days. The villagers cut a branch of a karam tree, plant it in the middle of the 'akhrá,' or dancing-ground, and drink and dance round it. At this the Chandrani is the proper dance.

*Marriage ceremonies.*—Although Koroas do not marry until they are grown up, their marriages are often arranged by parents. The would-be-husband has always a say in the matter, and in his eyes, working-capabilities are the chief beauty in a wife. Koroas are divided into

several families, each of which is known by its 'gotor,' and no two people of the same gotor are allowed to marry. The gotor stands for our surname. An orthodox marriage is conducted as follows. First the betrothal is formally gone through by the parents of the bridegroom, taking to the parents of the bride two 'kalsis' of 'daru' or native liquor made from the 'mahwa,' and settling the price of the girl, which is generally about Rs. 5. The young man goes with his parents next time and takes besides the Rs. 5, a 'khasi' goat, a piece of cloth for his intended, and another for his future mother-in-law. On the wedding-day a feast is given at the house of the bridegroom's father to which all relatives and friends are invited, and a party of the bridegroom's friends go and bring the bride. A person called an '*aguait*' arranges all the ceremonies. The clothes of the bride and bridegroom which have previously been dyed yellow are tied together by the 'Lokundis,' who must be unmarried people. The 'Lokundis' are the bridesmaids and bestmen. The bridegroom then puts 'sindur' on the bride's forehead, and the '*aguait*' throws a fist-full of uncooked rice on the ground. The happy pair then go and *salaam* to their parents and to the assembled company. They then seat themselves between their parents, and the husband puts bangles on his wife's wrists, and anklets on her feet. The company then begin to eat and drink, and afterwards the young people commence their dancing, which is kept up all night. The next morning, after a final drink, all the party go and bathe, and then leave the happy couple to their own devices.

*Marriage customs.*—A Koroa can marry a second wife, if he has no children by his first, or if his first wife leaves him, or if he is divorced from her. If his wife leaves him, he can get back her price, from her parents or guardians, and this is as good as a divorce. Widows can remarry, and a man who marries a widow or divorcee is called a '*Biyáhur*.' If a man leaves his wife without a cause, she can call a '*pancháyat*,' and have him find Rs. 5. When young people marry without their parents' leave, it is called a '*Dhuku*.' The relatives then hold a '*pancháyat*,' and make the young man give a 'khasi' goat and two 'kalsis' of 'daru,' for their benefit.

*Birth customs.*—For about a week or ten days after a birth, the mother is considered unclean. Children are named a month after they are born. They are only named after their grandparents, when the mother dreams of a visit from the said ancestors. If a girl is to be born, the woman dreams that either her own or her husband's mother came with offerings of 'tarpát' earrings or beads; but if a boy is expected, she dreams that either her own or her husband's father came with an offering of a 'dibi' or a 'batua' (small brass pots for eating out of).



The child is then called its grandparents' 'aotár,' and is named after the said ancestor. A big feast is always given at a christening. Boys are preferred to girls.

*Young people.*—Boys are burnt on the forearms, when they are about ten years of age, but girls are not tattooed like Munḍas, Kharias and Uraons. Property descends only to male heirs. Every large village has its Dhamkuria or bachelor's quarters, for boys who are too old to live with their parents. Girls stay with their parents until they get married. The dancing-ground is usually an open space in front of the Dhamkuria. Young people enjoy considerable freedom until they are married. There are no old maids amongst Koroas. Children take the 'gotor' of their father.

*Death Customs.*—When great persons die their remains are conveyed to the banks of a river and burnt by their relatives. Ordinary people are buried and large stones are placed over their graves. When the Pahan Pujár or Dowar die, their remains are burnt and buried in their own fields. Ten days after a death, the nearest relatives give a big dinner. When a pregnant woman dies, her ghost haunts its relatives and has to be turned out of the village with the assistance of the Baiga.

*Appearance.*—In appearance the Koroas of Jashpur, Sirguja and Barowai are usually very black with flat square faces, and matted locks. Physically they are short but very strongly made.

### *The Pahariyá-Kharias.*

*Habitat.*—The Pahariyá-Kharias have little to boast off in the way of history, and those in the south-west have the same tradition as the Kharias of Lohardagga, viz., that they came from 'Roides' and 'Kharia-ghát.' They are found scattered on the hills in the south of Mánbhúm, in various parts of Singbhúm and Kionjhar, and on the borders of Gangpur and Raigarh, and (as their name implies) they are exclusively hill men. At the foot of the hills in the thickest jungles are found the Peraí-Kharias, who are said to have been outcasted by the hill men, and with them are also found the Makria-Kharias, both these tribes being gross feeders. The Makria-Kharias eat monkeys, and thus stand in the same position to the Kharias as the Birhors to the Munḍas. It is most probable that in ancient times all the Kolarian tribes ate monkeys.

*Language.*—There is a difference in the language of the hill and plains of one word in twelve, and the following are a few examples:—

<i>English.</i>	<i>Plains-Kharia.</i>	<i>Hill-Kharia.</i>
Cloth	... Lutui	... Sirak.
Fever	... Ghorna	... Tonor.
Flesh	... Mas	... Kumang.

<i>English.</i>	<i>Plains-Kharia.</i>	<i>Hill-Kharia.</i>
Foot	... Katta	... Jura.
Jackal	... Tuyin	... Karcha.
Monkey	... Bandar	... Sakoi.
Morning	... Meang	... Patar.
Plantain	... Kera	... Kondo.
River	... Ompai	... Jor.
To-day	... Musa	... Kone.
Near	... Ubdu	... Ekor.
Weep	... Yamna	... Libdana.
Bad	... Bekar	... Kambo.
Old	... Buddha	... Kendrubo.

*Divisions.*—There are two tribes of hill Kharias, the ‘Pahariyá’ and the ‘Neosa.’ The Pahariyás are the more civilized, being more fastidious as to their food, and wearing cloth, while Neosas are said to eat cows, and animals that have died of disease, and most of them wear only leaves. Neither of these tribes can speak any language but their own, but it is only with difficulty that they can understand each other.

*Food.*—Pahariyá-Kharias eat buffaloes, sheep, goats, pigs, fowls, &c., but not cows, tigers, snakes, lizards, &c.

*Religious Festivals.*—In religious ideas the Pahariyá-Kharias are wonderfully advanced. They worship the Sun, ‘Giring Pújá,’ every two or three years, in the months of June or July, the head of every family doing his own pújá, on a bare rock, and offering a white cock, a white goat, or a white pig, according to his circumstances. Every village has its priest, or ‘Kalo,’ who must be a Kharia, and his sacrifices are to be made at the ‘Sarna’ or Jangkorbo. In February there are three festivals. At the ‘Phágun’ festival each household offers its own sacrifice. At the Jangko festival, the Kalo offers a sacrifice for the whole village. This festival is kept in honour of the Mahua and Mango, which fruits are then in season. Then there is the ‘Lamlam,’ or hunting festival, at which the Kalo again officiates for the whole village. At all these festivals the ‘Tharia’ is the fashionable dance. In June each household offers its ‘khidori’ sacrifice. In September the ‘Kalo’ offers the ‘kadoleta’ sacrifice, at the cutting of the upland crops. At the ‘Karam’ festival, in September, the young people of both sexes offer sacrifices at the akhrá, or dancing place. In October the ‘Kalo’ offers a sacrifice at the ‘Kharra Pújá,’ of a brown khassi goat, and three cocks and one hen of different colours. The ‘Bandai’ festival is kept in October, and at this they dance the ‘Jadura.’ They dance, the ‘Desaoli’ in May and June and the ‘Jadura’ in October, November and December. In the months of February and September each house-

hold offers a sacrifice to its ancestors, who are supposed to act as guardian angels to their living relatives.

*Demons.*—It is the 'Kalo's' duty also to keep an eye on the various malignant spirits that haunt every Kharia village; and to propitiate them when necessary. The following are the most common of such evil spirits: The 'Pahto-Dubo' or horse demon. The 'Dorbo-Dubo' or elephant demon. The 'Gorea-Dubo' or fire demon. The 'Raksa-Dubo' has a man's body with big protruding teeth, and he carries a rod with a noose at the end of it, for catching people with, a big basket to put them into, and a hatchet to kill them with. He can only be appeased by the offering of a ram. Then comes the 'Gumi-Dubo,' whose proper sacrifice is a cow. When sacrificing to these demons, the priest kills the animal, whatever it may be, and runs away. The other evilly disposed spirits are the ghosts of women who have died while pregnant, called 'Churil-Dubos', and the ghosts of people who have met with violent deaths, called 'Jianth-Muabs.' These sometimes go about screaming or crying at night, and they inhabit large trees by the roadside, and pounce down on people who do not offer sacrifices. They frighten and sometimes kill the unfortunate wayfarer. The 'Pahariyá-Kharias' also personally offer sacrifices to the 'Baranda-Dubo' who lives in ant-hills. The sacrifice for this demon may be a buffalo, a ram, or a pig.

*Good Spirits.*—All the gods of the Kharias, however, are not evil. There are two great good spirits named Dhowlagir and Mainagir, and these have several spiritual apostles, who do their bidding. Three of the said apostles, known to my informant, were named 'Deogan-Guru,' 'Lugu-Guru,' and 'Mado-Mantri. Some 'Pahariyá-Kharias', known as 'Deonra-Lebus' or 'Motis', can invoke the above mentioned good spirits, but only for good purposes. The ceremony is as follows: The 'Deonra-Lebu' takes a 'samu' or bamboo fan, in which he puts some rice, and he places a small light in front of him. He then begins to rub his hand over the rice, and to invoke the good spirits with the following chant—

"Come, come along, on the road I will make you sacrifices.

"Here I stand, your priest, cause the sick man to be set free, and I will give you sacrifices.

"Keep me (as your Deonra Lebu), and at the head of the waterfall I will make your sacrifices.

"Make the sick man stand up, walk and work, and then will I give you sacrifices."

If the sick man recovers, the 'Deonra-Lebu' knows that Dhowlagir and Mainagir have granted his prayer, and he gives his sacrifices according to promise.

*Witches*.—But should the person die, and there be the slightest suspicion of the existence of a wizard or witch in their midst, the Deonra-Lebu again calls the good spirits to his assistance, and sees the wizard's or witch's face in the light that is set before him. He then tells the 'Re,' or head of the village, who calls up all the villagers and explains the circumstances. The unfortunate wizard or witch is then turned out of the village, with much bad language and rough treatment. If any resistance is offered, the offensive person is beaten and sometimes killed outright.

*Marriage customs*.—'Pahariyá-Kharias' only marry when they come of age, and widows or divorcees are allowed to remarry. They may marry two or more wives, but very few ever do so. They must, however, only marry with other Pahariyá-Kharias, and the parties to the marriage must be of different 'gotors' or septs. The following are a few such septs, viz., 'kiro' tiger, 'dungdung' eel, 'bilung' salt, 'baa' dhan, 'kerketa' a bird, 'soreng' stone, 'kulu' tortoise, &c. Pahariyá-Kharias have no 'dhamkuria' or bachelor's hall, but they have an 'akhrá' or place for dancing. Marriages take place at the home of the bridegroom, outside of the house. The groom has to pay the girl's father a present, called 'gining.' This is not paid in money but in cattle. A fair price for a wife is two buffaloes, or seven heads of cattle. All friends and relatives are invited to the marriage feast. The bridesmaids anoint with oil the heads of both bride and bridegroom. The bridegroom then puts sindur on the forehead of his bride, and she returns the compliment. The best man then splashes them both with water, and the ceremony is complete. The happy couple are then carried about, by two strong men, to receive the congratulations of the company. After this the party sits down to eat and drink, and the rest of the night is spent by the young people in dancing, and by the elders in drinking. Next morning they all go and bathe together, in the nearest river or pond. When a man cannot afford to have a ceremonious marriage, he marries without ceremony, and this is called a 'dhuku' marriage. If married people cannot agree, they are at liberty to separate and to remarry with others if they choose.

*Regarding children*.—All property descends to male heirs. After child-birth the mother is considered unclean for six days, and during this time she must live and eat in a separate room by herself. The child is named when it is a month old. To find an auspicious name, grains of rice are thrown into a bowl of water, as each name is called, when all the grains come together at the bottom of the bowl, the last mentioned is the proper name. When boys reach the age of 8 or 10 years, they have their forearms burnt. Girls at about the same

age are tattooed (by 'Malar' women) on their foreheads and temples, never elsewhere.

*Regarding the dead.*—The rich burn and the poor bury their dead. Dead people turn into ghosts, and these live chiefly near their burial-grounds. When a person is dying, all the ghosts in the neighbourhood get round his deathbed, and dance and make merry, for a new 'muah' or ghost is about to be born to them. People on the eve of death can see such ghosts, and then they know their time has come. The ghosts of people who die a natural death are quite happy, and do not molest the living.

### *The Sobors or Savaras.*

*History and traditional references.*—The Savaras (a numerous section of the Kolarian race) are the southernmost of any of the aboriginal tribes who still speak a Kolarian language, and they have maintained their distinctive title from very ancient times. There is an inscription cut on the rock at Girnar in Gujerat from which we learn that Rudra Dāma (one of the Sah kings about 300 B. C.) conquered the Savaras and other wild tribes; and the Savaras are also referred to in the Purāṇas as a wild tribe in the south-east. Ptolemy mentions the Sabaræ, and Pliny speaks of a tribe of Suari. Martin in his *History and Antiquities of Eastern India*, says that a large tribe of Siviras are traditionally reported to have existed and flourished in Sháhábád and Bihar contemporaneously with the Cheros, but there are none in those districts now. However Sherring in his "Tribes and Castes of India" states that a tribe of 'Seoris' who were in former times much mixed up with the Bhars, Cheros, Kols and Kharwars, were once established in Ghazipur and Mirzapur, and that a few are now to be found in Central India. "These people much resemble the Gipsies of Europe. Their women wear a tartan dress and often have a kind of horn projecting from the forehead as an ornament. They live in light and easily-moved booths made of grass and reeds, are fond of intoxicating drinks, and eat the flesh of swine and oxen. They procure wives for their young men by kidnapping female children, and live principally by jugglery, coining false money and theft."

*Mythological and Historical references.*—It is difficult to say whether these 'Seoris' are a branch of the Savaras of the south or not. A Mahābhārata legend says that the Savaras were created from the excrement of the wonder-working cow "Nandini," which belonged to the hermit 'Vasishṭha,' who employed them to punish a Kshattriya king named

"Viśva-Mittra" the son of Gadhi, king of Kanauj. From this legend it might be inferred that the Bráhmans employed an army of Savaras, (whom they imported from the south) as mercenary soldiers to fight on their side against the Rájputís of Kanauj. These Savara soldiers would naturally leave their wives behind, and this would account for their almost total extinction, and for the necessity for their young men to procure wives from other tribes. The Cheros and Kharwars with whom the Savaras were associated are still very numerous and prolific in Mirzapur, Sirgúja, Palamu and other neighbouring districts.

*Geographical Distribution.*—In Sambalpur, Orissa and Ganjam the Savaras are found in various stages of civilisation and adopting various languages and customs according to their surroundings. In Ganjam they speak a mixture of the Kolarian and Dravidian languages and are known as Sonds, Sowras, Jara Savaras, Luda-Savaras, Arisa-Savaras and Tekkati-Savaras. In the Native States of Orissa and in parts of Sambalpur they speak dialects of Uríyá and are divided into the following sub-tribes, *viz.*,—

*Divisions.*—Sowras or Saondas, very hinduised cultivators. Taalas, very hinduised cultivators. Bentkars, hinduised, and weavers by trade. Ludhas, hinduised, and blacksmiths and ironsmiths by trade. Kella-Sobors or Potor-pinda-Sobor, the men are musicians and the women dancing-girls. It is said that in former times their women only wore leaves.

*Sub-division of Sobors.*—The purest representatives of the race call themselves Sobors, and speak a dialect of the Kolarian language which could be understood in Chuṭiyá Nágpur. These people are only to be found in the most jungly parts of the Native States of Orissa and Sambalpur, and a few are also found in Gangpur one of the southern tributary states of Chuṭiyá Nágpur, and the following notes only refer to these Sobors.

They are divided into three sub-tribes, *viz.*,—

1. Pardhea or Jara-Sobors are cultivators and shikaris. They, are sometimes known as 'Kurus.' They eat pigs, fowls, goats, fish &c., but not cows, buffaloes, tigers, lizards &c.

2. Potkota-Sobors, boat and string-makers and cultivators. They can eat the same animals as the Pardheas and also buffaloes, but cows are forbidden.

3. Bassu-Sobors are chiefly cultivators. They can eat the same as the Pardheas and also shell-fish.

These sub-tribes cannot intermarry or eat together, but they dance, drink and otherwise fraternize quite freely.

*Septs and Totems.*—They are divided into numerous septs of which the following are a few, viz.,—

Saram,	* sambar	cannot eat.
Murmu,	nilgai	do.
Barhia,	wild pig	do.
Guincha,	tree mice	do.
Ir-tirki,	guinea-pig	do.
Nag,	cobra	cannot kill.
Sua,	parrot	cannot kill or eat.
Toro,	lizzard	do.
Hemrom,	a bird	do.
Pardhán, a title, the man who reinstates into caste.		
Bisual, a title, the man who officiates at deaths.		
Nega, a title, headman of a village.		
Bhui or Bohi, those who carry palkis.		

No two people of the same sept can intermarry. The wife belongs to the sept of her husband after marriage, and male and female children belong to the same sept as the father.

*Religious Festivals.*—The Sobors who retain their aboriginal customs have priests of their own tribe, who sacrifice goats, fowls, pigs &c at the village 'dimur' or spirit-grove. The head priest is called 'Turi' or 'Jhankor' and his assistant the 'Lengena,' and these offer sacrifices at the following festivals, viz.,—

Mágh-porob and Mágh-puni	in January.
Phagua, Phágun-pun and Gundi-Khia	in February.
Choit-porob and Choit-puni	in March.
Boiság porob	in April.
Jet-puni	in May.
Assar-porob or Dutia	in June.
Rakhi-puni and Pura	in July.
Nua-khia, Korma and Ekadasi	in August.
Tugilosa, Buriusa and Dalkhai	in September.
Kártik-puni, Bhajinta, Pojinta Borousa }	in October
Usa-borot, Kolasi-usa and Kola-Chusa }	and November.
Pús-puni	in December.

*Gods and Demons.*—The head of every household is also supposed to sacrifice to numerous gods, of which the following are a few. Gorom-poti, village god. Bonera, hill god. Bons-poti, jungle god. Panch-konda and Peta-bulia, outside gods. Ludha and Ludni, Kandi-bent, Pagura-bent, and Pardhia-bent are household gods. Debí, Mahádeo, Mahábír, Bura-Bhim, Bhogia Bura-Deo are all great gods. Satbohoni and Jolkomoni are water nymphs, and the following are demons of

sorts, Rakas, Bodru, Kalka, Rui bonga, Podmasini Temasini, Bhandar-gohoria, Churguri, Horli-pat and Kondra-pat.

*Dances and Music.*—Sobors have the following dances; viz.,—

Jadura	men and women together.	
Karma	do.	
Khedapar	do.	
Jatra	do.	
Kalanga	do.	
Biha	do.	at weddings.
Sudni	only women.	
Konkor	do.	
Kheldi	single woman of Kela Sobor tribe.	
Dond	danced by single man carrying bells on a stick.	

They use the following musical instruments: Lepur, Champ, Bet-bari. The Kela-Sobors use the Khonjini or Ghurka, a peculiar instrument which emits groans and grunts.

*Wedding customs.*—The uncivilised Sobors do not marry until grown up and the price of a wife is usually Rs. 5. Widows and divorcees can remarry, and a divorce is effected by returning the price paid for the wife. The marriage takes place at the man's house, and the bride is borne to the wedding on the backs of the bridesmaids. The bridegroom has to give a cloth to the bride, her mother and younger brother. At weddings Sobors do not dance the war-dance of Chuṭiyá Nágpur, but have a peculiar wedding-dance of their own. The preparations for the wedding party are very much the same as in Chuṭiyá Nágpur.

*Marriage customs.*—They have the usual 'Mandua-tand.' Branches of 'Mahun' and 'Sargi' are planted on the altar, which consists of a four-cornered mound of earth, at each of the corners of which are placed water-pots with lights in them, a string being passed round the lot. The ceremony commences by the happy couple holding each other's little fingers and marching seven times round the 'Chounda' or altar, the woman going in front. The two being then seated together, the bridegroom puts a spot of 'sindur' on the bride's forehead with his right hand little finger, and she returns the compliment in exactly the same manner. The bridesmaids then draw near and tie the clothes of the pair together. After this they make the bride promise never to leave her husband, and (as it were to certify to the contract) put a big broad mark of 'sindur' on the bride, reaching from the crown of her head to the tip of her nose. The happy pair then retire into a house prepared for them, while the rest of the party sit down to dinner. After dinner dancing and drinking are commenced and usually carried on until next



morning. Early in the morning the bridesmaids appear to wash the feet of the newly-married couple, the man receiving their attentions first. Sobors are permitted to marry as many wives as they choose, but do not usually have more than one.

*Customs relating to children.*—After childbirth the mother is considered unclean from six months to a year, and the husband has to live and eat apart from his wife, not even being allowed to drink water from her hands; and if there are no female relatives in the house, he has to do all the cooking. To effect a purification an official called 'Pardhán' has to give some drinking water first to the mother and then to the father, and finally to drink some himself, each one drinking out of his or her own hand. Just previous to this ceremony the mother has to bathe. Before the purification, neither the father nor the mother can eat meat. After the purification they have a big dinner to which relatives and friends are invited. In Chutiyá Nágpur the 'Pardhás' are a sub-tribe of the Kheroars or Bhogtas. The Sobors do not usually burn 'sika' marks on the boy's fore-arms, as is customary amongst the aboriginal tribes of Chutiyá Nágpur. Girls are tattooed chiefly on the biceps. The Kol custom of tattooing on the forehead is practised by a few; but I noticed only old women with these marks, and I therefore presume the custom is dying out. The tattooing is done by the women of the Temna or brass-working caste. Amongst Sobors all property descends to male heirs only. The 'Dhamkuria' or bachelor's hall of Chutiyá Nágpur villages is not known amongst the Sobors. The Sobors usually bury their dead and put stones over the graves. The clothes, ornaments and sometimes the weapons of the deceased are buried with them. They believe in the existence of the spirits of the dead and also that they haunt their own homes; therefore at meals it is customary to put aside a pinch of food and some liquor to show the spirits they are not forgotten. Sobors are very superstitious; they believe in sorcery, and people suspected of practising the black art are hated, feared and often ill-treated. A grim sect of these people, known as 'Bisuals,' are the officials whose duty it is to offer sacrifices to the dead. They get paid for their services, and the office is hereditary, so that the Bisuals will doubtless become a sub-tribe in time, just as the Baigas have done amongst the aboriginal tribes in the Western Native States of Chutiyá Nágpur. The Bisual sacrifice consists of rice and the gum of the Sarai tree.

*Language.*—The following list of words shows where the Sobor and Saonda differ most from other Kolarian languages.

<i>English.</i>	<i>Sobor.</i>	<i>Saonda.</i>	<i>English.</i>	<i>Sobor.</i>	<i>Saonda.</i>
Ant	Juri	Bobo	When	Kote	Yenga
Boat	Dhondsa	Voda	Bad	Bogda	Sedele
Day	Angiana	Tamba	White	Tele	Palu
Where	Kon	Tenga	Small	Dihing	Doyina
Without	Guritke	Vodita	Thin	Pandra	Palapala som
Near	Hopora	Yuya	Hungry	Baing	Dolijan
Much	Birbarang	Bari	Be silent	Atupme	Kandang ama
What	Kate	Vongado	Hear	Anjom	Andangna

*Há-shang-rgyal-po and Ug-tad, a Dialogue. From the Tibetan.*

*By KARL MARX, Missionary at Leh, Ladakh.*

(Once upon a time) there was a king named Há-shang, who did naught but sin. (Now), had this king died, he would have gone to perdition; Chom-dan-das, however, had mercy upon him, and transformed himself into a minister called Ug-tad.<sup>1</sup> After he had come into the presence of the king and performed his obeisance, (the king) accepted him as his minister.

(It so happened, that) the king had two wives. Now, the king raised his second wife<sup>2</sup> to (the rank of) the first and gave her the golden crown. The first wife<sup>3</sup>, being jealous, threw the Chhang<sup>4</sup>-cup at the king. The king resented this and gave the command to Ug-tad: 'Go and kill' this woman!' Ug-tad replied: 'It is not right to kill the queen for an offence so trifling.' The king (again) said: 'If you will not kill the queen, I shall kill you!'

Then Ug-tad conducted the queen to a grave-yard, and after having made her over to the care of the hobgoblins,<sup>5</sup> he made a sign to her meaning: 'don't be afraid,' and left her.

Thereupon he returned to the king. The king asked: 'Have (you) killed (her)?' The minister said: '(Yes, I) have killed (her).' 'Very well,' said he.

<sup>1</sup> འུག་ཏཱ་

<sup>2</sup> རྒྱལ་མ་

<sup>3</sup> རྒྱལ་མ་

<sup>4</sup> རྒྱལ་ the beer of Ladakh and Tibet.

<sup>5</sup> 'Kill and come' རྒྱལ་པོ་ལྟོ་ལོ་

<sup>6</sup> རྒྱལ་པོ་ལྟོ་ལོ་

'Ug-tad,' the king (then) continued, 'your erudition is considerable, and your parts are good. (Tell me then) : amongst acts performed by human beings, which are well (done) ?'

The minister said : 'If you do not consider accomplishments of little account ; (this is) well (done) ;

'if you do not look upon learning as being a fraud ; (this is) well (done) ;

'if a rich man keeps his wealth under control,' (this is) well (done) ;

'if a poor man curbs his tongue ; (this is) well (done) ;

'if a woman subdues (her own) body ; (this is) well (done) ;

'if the Tsun-pa<sup>3</sup> fulfils the disciplinary statutes<sup>5</sup> ; (this is) well (done) ;

'if the Ngags-pa<sup>4</sup> keeps the vows<sup>6</sup> ; (this is) well (done) ;

'if the king can govern ; (this is) well (done) ;

'if a man rises above bad report<sup>6</sup> ; (this is) well (done) ;

'if a sick man conforms with the rules of diet<sup>7</sup> ; (this is) well (done) ;

'if all (men) always were successful ; (this would be) well ;

'Brothers are good companions ;

'one's own relatives make good governors ;

'father and mother are dear to the heart ;

'a wife is pleasant to give one food ;

'a neighbour is nearer than a relative at a distance ;

'on-foot is swifter than a weak horse ;

'vegetables are sweeter than a porridge made of bad grain ;

'there's more pleasure in being a spinster, than in having a husband with an evil countenance.'

1 In this and the following 8 sentences, the original always has གྲུབ་པ་ to be able, etc.

2 བརྗེན་པ་ Priest, Reverend.

3 འཇུག་ཁྱིམ་པ་

4 ལྷ་ཁྱེད་པ་ Magician.

5 དམ་འཁྲུག་

6 Orig. ལྷ་ཁྱེད་ Jäschke, Dict s. v. ལྷ་ཁྱེད་ leaves the meaning, which is defined by Csoma as given in the text, still doubtful. In Ladakh the word is entirely unknown.

7 Tibetan dietary rules forbid under circumstances meat (esp. of goats), sour milk, onions, chhang, anything sour, salt, vegetables, cold water, unless after its having been boiled previously ; sleep during daytime is also strictly forbidden to any patient.

Upon this the king considered: "A wife is pleasant to give one food," this is truly said; "there is more pleasure in being a spinster, than in having a husband with an evil countenance," is true likewise. Such has been said unto me. 'Again he thought: 'Ug-tad (probably) did not kill the queen,' so he said to Ug-tad; 'for the sake of one single offence, to command you: "kill the queen!" was not right; therefore, if the queen is not dead, I will make over my reign to you, (if) you go and bring<sup>1</sup> her (here).'

Ug-tad said: 'To raise a person from the dead, and to come and bring her (back), is a thing unheard of.'

The king said: 'Is there any means of bringing her to life again?'

Ug-tad said: 'None that I have. Had Your Majesty<sup>2</sup> not ordered me to kill her, I would not have dared to look at the queen [MS. with my eyes]; much less would I have dared to put her to death. If, for instance, you leave a<sup>3</sup> hatchet without a handle in an empty riverbed, then (surely) no wood will be cut. And I, just as little, have any means of bringing her to life again. I, too, was no party in her execution; it was Your Majesty,<sup>4</sup> who put her to death.'

The king said: 'As it seems evident, that the queen is not dead, bring her here<sup>5</sup>!'

Ug-tad said: 'She is dead. This is very much like the stories of the dove and of the hoopoe in times gone by.

'There once were two doves, a married couple, who, in autumn, hid some fine barley in a hole. In winter it dried up and grew less (in bulk). The husband (noticing this) said: 'Wife, thou hast eaten it!' and struck his wife with his bill and killed her. After spring had gone by, however, the hole was full again, and now the dove husband said: '(Indeed,) thou hast not eaten it, stand up!' But his wife being dead, a few maggots only came out.

'Also a hoopoe-couple once found seven peas. In order to eat (them some other time), they dug with their bills (in the ground) and hid (the peas) in the furrow. But the furrow closed up, and they

<sup>1</sup> Orig. འོ་ལ་ཤོ་མ་ bring and come.

<sup>2</sup> Orig. ཐུ་ལ་པོ་ལ་ the king.

<sup>3</sup> MS. adds མྱིང་པ་ ? i. e. མྱིང་པ་ sharp, but its entire omission seems an improvement.

<sup>4</sup> ཐུ་ལ་པོ་ལ་ཤོ་མ་

<sup>5</sup> འོ་ལ་ཤོ་མ་

could not find (the peas). (Then) the husband said: 'Thou hast eaten them!' and killed his wife. Next summer, for every pea one flower sprang up, and the hoopoe said: 'Last year's peas, all seven, this year have brought forth the flower Ha-lo, and now many peas will grow. So thou shouldest stand up! don't be long! arise!' But on lifting her up with his bill, a few maggots (only) came forth.

'Similarly, Your Majesty,<sup>1</sup> after having destroyed the queen, said (to me):' Ug-tad, you are (a) superior (person),<sup>2</sup> go and bring back<sup>3</sup> the queen!' But I say<sup>4</sup>: 'I never committed any mean offence<sup>5</sup>, I never did a sinful act, I never took an unlawful wife, it was not I who killed the wife in question, and she being dead, there is no hope of her ever returning. (As it is), Your Majesty is (undoubtedly) my superior<sup>6</sup>.'

The king said: 'Ug-tad, you should not tell falsehoods, but go and fetch (my) queen!'

Ug-tad said: 'Falsehoods there are many indeed:

'to say: there are five horses flying about, is a falsehood;

'to say: ants go to parched wheat, is a falsehood;

'to say: fish have their hearts in their heads, is a falsehood;

'to say: to a male a boy is born, is a falsehood.'

The king said: 'You are talking absurdities.'

Ug-tad said: 'Absurdities there are many indeed:

'(to say:) winter is naturally getting hot, is absurd;

'(to say:) summer is naturally getting cold, is absurd;

'to reject the advice' of a loving friend and listen to the flatteries of an enemy who hates you, is very absurd.'

The king said again: 'You are a disgustingly foul (fellow) !'

Ug-tad said: 'Disgustingly foul there are many indeed:

'the archer's collar is foul;

'the tongue of a man digesting is foul.'

The king again said: 'You are hankering after disease!'

Ug-tad said: 'Hankering after disease, there are many indeed:

1 ཐུག་པོ་ 3rd, i. e., 2nd person.

2 རྒྱུ་རྒྱུ་ཆེ་བ་ 3rd, i. e., 1st person.

3 ཐོད་པ་ལྟ་བུ་

4 ཐོད་པ་ལྟ་བུ་ 3rd, i. e., 1st person.

5 རྒྱུ་རྒྱུ་ཆེ་བ་ i. e., a work of small dimensions.

6 རྒྱུ་རྒྱུ་ཆེ་བ་ ཐུག་པོ་ 3rd, i. e., 2nd person.

‘if a man, not ill, takes drugs, he is fond of disease ;  
 ‘if a sick man can’t submit to régime, he is fond of disease ;  
 ‘if in winter, a man puts on thin clothes, he is fond of disease ;  
 ‘if in summer, a man sits down on damp ground, he is fond of disease.’

The king said : ‘You want to destroy yourself !’

Ug-tad said : ‘Wanting to destroy themselves, there are many indeed :

‘one going to combat without armour, wants to destroy himself ;  
 ‘one climbing a steep rock, wants to destroy himself ;  
 ‘one crossing a raging torrent, wants to destroy himself.’

Again the king said : ‘You wish to die.’

Ug-tad said : ‘Wishing to die there are many indeed :

‘one walking over a glacier in summer, wishes to die ;  
 ‘one climbing a tree in winter, wishes to die ;  
 ‘a fat sheep in autumn, running into a village, wishes to die ;  
 ‘if a bad man is passionate, he wishes to die.’

Again the king said : ‘You are in error !’

Ug-tad said : ‘Erring there are many indeed :

‘if a man does not guard himself against disease, he is erring, for there is a risk of his being attacked himself ;

‘if a man does not guard against cattle-disease, he is erring, for there is a risk of his own cattle-yard being made empty ;

‘if a man robs another man’s wife from his bosom, he is erring, for there is a risk of himself being killed through the chastisements of the other ;

‘if a man takes oaths on things good and evil, he is erring, for there is a risk of his posterity being (suddenly) cut off ;

‘if a woman deserts her husband and makes love to another, she is erring.’

The king again said : ‘Your power of speech is terrific.’

Ug-tad said : ‘Terrific are many things indeed :

‘the earth giving way, would terrify the hare ;  
 ‘the heavens breaking down, would terrify the duck ;  
 ‘the thing-ril<sup>1</sup> is terrified by the swamp drying up ;  
 ‘the child,.....<sup>2</sup> having come, is terrified.’

Again the king said : ‘You can’t keep within bounds !’

Ug-tad said : ‘Immoderate are many indeed :

‘if a poor man has become rich, he will be immoderate in boasting ;

<sup>1</sup> Name of a Tibetan bird not known.

<sup>2</sup> An omission in MS.

'if a bad companion has been indulging in slander, he (afterwards) will be immoderate in hypocrisy ;

'if a vulgar person<sup>1</sup> has conceived a great hatred, he will be immoderate in the use of violent language.'

Again the king said : 'You are (one of those fellows saying :) if only I could, I would be glad.'

Ug-tad said : 'Glad if they could, there are many indeed :

'if one could (avert) the calamities connected with riches, one would be glad ;

'if one could (command) the vigour of a country, one would be glad ;

'if one could (endure) the talk<sup>2</sup> of a wife, one would be glad ;

'if a champion could keep peace,<sup>3</sup> one would be glad.'

Again the king said : '(But) you are saying, I can't !'

Ug-tad said : 'Not able (to do a thing,) there are many indeed :

'one vanquished cannot boast ;

'many (at once) cannot govern a country ;

'a rich man has no control over his wealth ;

'a poor man has no control over his stomach.'

The king again said : 'You don't know shame !'

Ug-tad said : 'Knowing no shame, there are many indeed :

'dress knows no shame ; (still) there should be moderation in dress<sup>4</sup> ;

'sleep knows no shame ; (still) there should be moderation in sleeping ;

'the stomach knows no shame ; (still) there should be moderation in eating ;

'carnal desire<sup>5</sup> knows no shame ; (still) there should be moderation in cohabitation<sup>6</sup>.'

Again the king said : 'It is possible to prolong the queen's life !'

<sup>1</sup> ཁ་དམན་ཁྱེས་ a low mouth.

<sup>2</sup> ཁྱོས་

<sup>3</sup> ཁྱོ་གས་མདུན་མ་ཐུབ་ན་—to མདུན་མ་ the meaning of treaty, peace is unhesitatingly and invariably given by my Tibetan assistants; the 'Ge-sar' (MS.) uses it frequently in the same sense, e. g., 'a treaty of five years' duration,' in: ཁྱོ་ལྷའི་མདུན་མ་ (ཐུབ་ནས་སྟོང་)—i. e., keep, endure would be more accurate.

<sup>4</sup> It should be worn neither too long nor too short.

<sup>5</sup> འཕྲོད་ཆུང་ས་ cf. the use of the German Wollust.

<sup>6</sup> དེ་ཐུས་ཆོད་ ཡོད་ : 'having done it; enough.'

Ug-tad said: 'If it is possible to prolong the queen's life; what is to be done, if she is dead ?

'(Still if you want) to prolong life, there are (means) many indeed :  
'if (you) cure a sick man, (you) prolong (his) life ;  
'if (you) reconcile men quarrelling, (you) prolong (their) lives ;  
'if (you) give armour to men fighting, (you) prolong (their) lives ;  
'if (you) point out (to the stranger) the precipice and the water-course, (you) prolong (his) life.'

Again the king said: 'If it is true, that you killed the queen, then death would seem easy to me.'

Ug-tad said: 'Death seems easy to many indeed :

'if a man's family, elder and younger brothers, all have perished at the hands of men, death (seems) easy to him ;

'if one has incurred the contempt of one's equals, death (seems) easy to him ;

'if one is unable to fulfil one's obligations towards friends and relatives, death seems easy to him<sup>1</sup> ;

'if one's opponent in betting has left no pledge,<sup>2</sup> death seems easy.'

Again the king said: 'Although you never learnt all this,—how do you know it ?'

Ug-tad said: 'Things known, though never learnt, such there are many indeed :

'weeping one knows, though one never learnt it ;

'eating one knows, though one never learnt it ;

'lust one knows, though one never learnt it ;

'sin one knows, though one never learnt it.'

Again the king said: 'Although I was taught, yet I do not know it.'

Ug-tad said: 'Things taught, but not comprehended, there are many indeed :

'though you teach the lake where to go backward, yet it will not comprehend it ;

'though you teach the glacier to float downhill, yet it will not comprehend it ;

'though you teach the water (how to tie) a knot, yet it will not comprehend it ;

<sup>1</sup> མཉེན་ལྡན་གྱི་ཐུག་པ་ལྟར་མ་ལྟར་པས་ཀྱང་འཛིན་པ་སྟེ། translation somewhat doubtful. The translation given in the text is in accordance with the explanation given by Tibetans.

<sup>2</sup> ཐུག་པ་མཉེན་པོ་ལྟར་ལྟར་ མཉེན་པོ་ལྟར་པས་ translation as given is, I think, the one most appropriate.



'though you teach millet seed building, yet it will not comprehend it.'

Again the king said: 'That you should know all this, is most wonderful!'

Ug-tad said: 'Things most wonderful, there are many indeed:

'that the holy Chhos<sup>1</sup> should be preached and expressed in words, is a most wonderful thing;

'Sin renounced and virtue accomplished, is a most wonderful thing;

'Sitting idle and yet to complete (one's redemption) is a most wonderful thing;

'wealth and property heaped up and its crumbling away, is a most wonderful thing.

'Unseen and gracious Lha!

Unseen and terrible phantom<sup>2</sup>!

Untasted yet wished-for delight<sup>3</sup>!

Never partaken of, though sweet nectar!

Clouds undressed yet warm!

Bright sun and moon are without support!'

Upon this the king Há-shang, not knowing what else he should say, remained silent, and Ug-tad continued: 'Oh, great king! If you wish for elevation, attend to things that are low.

If you covet happiness, leave aside the causal connexion.

If you covet things near, traverse what is distant.

If you covet victory, put up with defeat.

If you covet wisdom, cultivate your mind.

If you covet Tsun-pa-ship, keep the ordinances.

If you wish for rest, feed your dog.

If you covet learning, leave the 'Chapter<sup>4</sup>.'

If you want joy, do the Chhos.'

(Ug-tad) having said this, the king believed and asked: 'Ug-tad, how must the Chhos be done?'

The minister said: 'The Lama patron-saint<sup>5</sup> must be worshipped

<sup>1</sup> ཆོས་ d octrine

<sup>2</sup> འཇིག་

<sup>3</sup> འདོད་ཆགས་

<sup>4</sup> བཅུ་ལྔ་དཔྱད་—ལྔ་ = chapter, no doubt, refers to the བཅུ་ལྔ་པ་དཔྱད་ 'seven chapters,' the most elementary book in Lamaistic religious literature.

<sup>5</sup> ལྔ་མ་ཡི་དམ་ Every one of the different Lamaistic sects professes adherence to one such patron saint; notably in Ld: the Sa-skyapa to Tsan, m. (monastery at Ma-sho), the Ge-ldan-pa to Dol-ma, f. (monasteries at: Tikse, Spi-tuk, Sang-kar, Li-kir)

like a Lha. The vow must be held like one's own body. Hearing, thinking must be developed so as to equal the border of the heavens. Thoughts must be meditated upon like the oceans. 'Oh king! trust a loving friend! Cohabitation gives no satisfaction; hence do not allow carnal passion to gush forth like a torrent.

'Of spiteful enemies there will be no end; therefore do not allow hatred to burn like a fire.

'Though this be the period of dullness and error, do not allow ignorance to advance like darkness.

'There should be no talk of one's own attainments; hence do not allow pride to be born like a mountain.

'Other people's want being loss to one's self, do not allow envy to whirl like a cyclone.

'The doing of works never will cease; take up, then, the burden of suffering.

'Of worldly goods enough, is a thing unknown; cut asunder, therefore, the knot of avarice.

'There exists no measure to indicate the time of one's death; hence exert yourself to be pious.

'There is no telling, when death will draw nigh; therefore don't put off (striving after) virtue until the morrow.

'A small sin even is visited with a heavy penalty; therefore do not commit sin at all.

'All men at the first were equal; pay attention therefore to other people's dying and not dying.

'When another (person) dies, do not mourn at his corpse; thyself also must die.

'Nothing else is of use; seize hold of the Chhos, for it is of use in the end.'

The king believed and said: 'Father and mother, though searched never found! Fire and water, needful morn and even alike! Wife though absent, yet to be found!

Needful in the end is the holy Chhos!

Ug-tad (again) said: 'If you of your own accord have come to believe in the Chhos, then body and intellect<sup>1</sup> both are annihilated by the mind.<sup>2</sup> These and the vanities<sup>3</sup> that are destroyed in the end, are

the Di-gung-pas to Ab-chi f. (monast. at: Sgang-ngon, Yu-ru, Shang.), the Dug-pas to Gon-po. m. (monast. at He-mis, Tchom-re, Stag-na.), the Rgyud-pas to Tsong-Khpa. m. (monast. at Ri-rdzong). All these patrons are said to have been great teachers and saints, either male or female.

(all) illusions. If you know the inner sense,<sup>1</sup> then there remains nothing that could be called death. Virtue or vice, whatever has been done in times gone by, what kind of lives have been led, let their footsteps be your guides. Dear friend ! do what is said in the holy doctrine.<sup>2</sup> Death being certain, do the holy Chhos. As there is no intelligence of our being exempt from death, be diligent and make haste. There is no profit in anything, but strain every nerve and seize hold of the Chhós. (The doctrine of) cause and effect<sup>3</sup> (in the moral world) being true, (accomplish<sup>4</sup>) virtue and renounce sin. Even at the risk of your life, don't throw aside the performance of the moral law. The state of metempsychosis causes weariness to the soul; having left behind the round of transmigrations and cast away suffering, happiness will spring forth.

'On love and compassion a loving heart for ever meditates.

'All—vanity and the inner sense, the two truths take to heart.'<sup>5</sup>

In such manner did (Ug-tad) teach (the king) many things. Thereafter in order to establish him in the faith, he (sent word) to the queen, formerly hidden, (saying) : ' The king — — — — —'

*Life of Atísa* (Dípaṃkara Śrījñāna).—By BĀBÚ SARAT CHANDRA DÁS,  
C. I. E.

Lha Lama Yes'e hod, king of Tibet, who held his court at Tholiñ in Ñah-ri was a devout Buddhist. He ruled peacefully over his country for many years. About the year 1025 A. D., he founded the monastery of Thoding at Tholiñ (the lofty place). With a view to introduce pure and undefiled Buddhist monachism in Tibet, he selected seven intelligent lads, each ten years old, and carefully trained them up in Tibetan. Then, with the consent of their parents, he admitted them into the sacerdotal order. When these lads advanced in their study of the sacred books and became

1 དེ་ནི་དམ་

2 བཞུན་

3 ཐུ་འབྲས་

4 MS. དེ་ལ་མེད་པ་སྤོང་ 'throw away both virtue and sin,' seems not to be in accord with the tenor of the previous exhortations; we prefer to insert ལྷུ་བས་  
fulfil.

5 ཐུང་ད་ལྷུ་

initiated in the practice of monastic discipline, he appointed two novice-monks (*S'ramaṇera*) to attend to each of them, and thereby increased the strength of his institution to twenty-one. Not satisfied with the Buddhist teachers of Tibet, whose cult had become greatly debased by the admixture of Tantrik and Pon mysticism, he sent these young monks to Kashmir, Magadha and other places of India where pure Buddhism still prevailed, with a view to their studying the philosophy of Ānanda Garbha of Kashmir and the code of monastic discipline. He commanded them to invite to Tibet, if possible, the renowned Kashmirian Pandit Ratna Vajra and Dharmapāla (the Buddhist hierarch of Magadha) and other holy men whose acquaintance they might make during their sojourn in India. He also instructed them to ascertain if there were any other pandits who, when invited, would be useful to the cause of Buddhist reformation in Tibet. Accordingly they proceeded to India in search of knowledge and holy men, bidding a long farewell to their native country. Though the king succeeded in getting the services of thirteen Indian pandits, it is said, that out of the twenty-one monks whom he had sent to India, nineteen died there from heat, fever, snake-bite and other causes. Rinchen ḥsaṇ-po, the great Lochāva, and Legs paḥi S'orab were the only survivors who had the good luck of returning to Tibet crowned with success. They studied Sanskrit under some of the eminent Sanskrit scholars of India and acquired great proficiency in the Buddhist literature. Bearing in mind the instructions of their royal master, they visited Vikramaśilā to inquire of the S'ramaṇas if there was a saintly scholar in their midst who, when invited to Tibet, would be useful to the reformation of Buddhism. There they heard of Dīpaṃkara S'riñāna, whose spiritual attainments and learning were of a superior order, and who then occupied the first position among the Buddhist scholars of Magadha. They were also told that he was, in fact, the second *Sarvajña* of the school of 500 Arhats which is commonly called the *Mahāsaṅghika*. The Lochāvas, however, did not venture to ask him to visit Tibet, being told that any such proposal would be premature at this time, if not absurd. On their return to Tibet they submitted an account of their experiences in India, and also of the condition of the Buddhist church of Magadha.

Greatly desirous of seeing the renowned sage of Magadha, the king commanded Rgya-tson-gru seṅge, a native of Tag-tshal in Tsang to proceed to Vikramaśilā, taking with him one hundred attendants and a large quantity of gold. After encountering immense hardships and privations in the journey, the traveller reached Magadha. Arrived at Vikramaśilā, he presented to Dīpaṃkara the king's letter with a large piece of bar gold as a present from his sovereign and begged him to honour his country with a visit. Hearing this, Dīpaṃkara replied :—

"Then it seems to me that my going to Tibet would be due to two causes :—first, the desire of amassing gold, and second, the wish of gaining saint-hood by the loving of others, but I must say that I have no necessity for gold nor any anxiety for the second." So saying he declined to accept the present. At this unexpected reply Gya-tson wept bitterly in his presence, wiping his tears with a corner of his sacerdotal robe. He explained to the sage that he was come from the country of Himavat thus far to Vikramaśilā, suffering immense privations, spending much treasure and suffering the loss of many of his companions who died of heat, fever, snake-bite and other causes in the journey, and at last he had to go back to his sovereign depressed at heart and disappointed in his hopes. Dīpaṃkara sympathized with him and tried to console him.

On his return to Tibet the Locháva explained to his royal master the circumstances of the failure of his mission and returned the presents. Thinking that it was hopeless to bring Dīpaṃkara to Tibet, the king again commanded the Locháva to proceed to Vikramaśilā to invite the scholar who was second to Dīpaṃkara in learning and moral purity. At this time Nag-tsho, a young monk of Gung-thân, met Gya-tson and begged to be his pupil, but the Locháva desired him to wait till his return from Magadha. He proceeded to India with five attendants and a small quantity of gold, barely enough to meet the expenses of his journey to Vikramaśilā.

At the same time king Lha Lama started for the frontier for the purpose of collecting gold. When he arrived to the south of Purang, he was attacked by the troops of the Rájá of Garlog (Garwal ?) and made a prisoner. The Tibetan force that was despatched from Tholing by the king's sons failed to defeat the enemy, and Chañchhub *Hod*, his nephew opened negotiations with the Rájá of Garlog who agreed to release the king on two conditions :—that either the king became a vassal of his and embraced his creed, or that he paid a ransom consisting of solid gold of the size and shape of the captive king's person. The second condition being more agreeable to Lha Lama than the first, his two sons and nephew Chañchhub *Hod* sent officers to collect gold from their subjects in Tsang, U, Kham and the nine minor provinces called the Lin-gu. The gold that was collected and brought for ransoming the king did not satisfy the heretic Indian chief. It is said that when melted and cast to form a statue of the captive king, the gold fell short of the quantity that would be necessary to make its head. Seeing that it was impossible to satisfy the greed for gold of the Garlog Rájá and despairing of his release, Lha Lama advised his sons and nephew to make considerable religious offerings at Thoding and Lhasa and also to repair the monastery of Sam-ye for his moral benefit. He impressed in their

minds the importance of inviting to Tibet a scholarly Indian pandit like Dīpaṃkara for reforming the degenerate Buddhism of his country. But his sons and Chañchhub, being anxious for his release, went back to Tibet to collect more gold. In the meantime Lha Lama died in confinement.

When the news of Lha Lama's death reached Tholing, Chañchhub made religious offerings at Thoding and Lhasa, and, with a view to give effect to his royal uncle's long-cherished desire of life, charged Nag-tsho Locháva of Guñ-thañ with the mission of going to Vikramaśilā in search of Gya-tson and also for inviting an Indian pandit to Tibet. Addressing the Locháva, he said:—"You know how degenerate the Buddhism of Tibet has become, how mixed are the religious practices here with the heretic cult of the red and blue robe Tantriks; the late king in his anxiety to reform our religion, thrice sent messengers to Magadha to bring the sage Dīpaṃkara Śrījñāna to Tibet. Gya-tson-senge has not come back, and it is not known if he is still living. You are also aware of the calamities which befell my royal uncle, and that cost him his life. Go, therefore, to Vikramaśilā, if possible, again to invite the renowned sage of Magadha to our benighted country, but if he still declines to come, invite the pandit who is second to him in learning and holiness." At first, the young Locháva, who was only twenty-seven years old, hesitated to take so difficult a charge upon himself, but the king having insisted on his going to India, of which place he had some experience, he agreed, though very reluctantly, to proceed to Magadha. The king gave him leave to equip himself for the journey with one hundred attendants and to furnish him with a large quantity of gold, but the Locháva would take with him only four attendants and a small quantity of gold. On his arrival at Vikramaśilā he met with Gya-tson, who was then prosecuting his studies under one of the learned pandits of the grand monastery. With the help of Gya-tson, who had by his long residence at Vikramaśilā and other Buddhist places of Magadha, learnt much of the ways and manners of the people of Magadha, the young Locháva became introduced to the principal personages of Vikramaśilā. He resided in the monastery for some time as a pupil of the abbot Sthavira Ratnākara, and with his assistance he succeeded in inducing Dīpaṃkara to visit Tibet.

Dīpaṃkara was born A. D. 980 in the royal family of Gaur at Vikramanipur in Bangala, a country lying to the east of Vajrásana (Gayá). His father called *Dge-vahi dpal* in Tibetan, i. e., "Kalyāṇa Śrī" and his mother Prabhavatī gave him the name of Chandragarbha, and sent him while very young to the sage Jetari an *Avadhut* adept for his education. Under Jetari he studied the five kinds of minor sciences, and thereby paved his way for the study of philosophy and religion.

Growing in age he acquired proficiency in the three *piṭakas* of the four classes of the Hīnayāna Śrāvakas, in the Vaiśeṣhika philosophy, in the three *piṭakas* of the Mahāyāna doctrine, the high metaphysics of the Mādhyamika and Yogāchārya schools and the four classes of Tantras. Having acquired the reputation of being a great pandit in the Śāstras of the Tīrthikas which he studied till the twenty-fifth year of his age, he defeated a learned Brāhman in Logic. Then, preferring the practice of religion to the ease and pleasures of this world, he commenced the study of the meditative science of the Buddhists which consists of the Trīśikṣhā or the three studies—morality, meditation and divine learning—and for this purpose he went to the *vihāra* of Kṛishṇagiri to receive his lessons from Rahula Gupta. Here he was given the secret name of Guhyajñāna Vajra, and initiated in the mysteries of esoteric Buddhism. At the age of nineteen he took the sacred vows from Śīla Rakṣhita the Mahāsāṃghika Aśhārya of Odantapurī who gave him the name of Dīpaṃkara Śrījñāna. At the age of thirty-one he was ordained in the highest order of Bhikṣhu and also given the vows of a Bodhisattva by Dharma Rakṣhita. He received lessons in metaphysics from several eminent Buddhist philosophers of Magadha. Lastly, reflecting on the theory of "the evolution of all matters from voidity" he acquired what is called the "far-seeing wisdom."

On account of these divers attainments which moved his mind variously in different directions, he resolved to go to Aśhārya Chaudrakīrti the High Priest of Suvarṇadvīpa. Accordingly in the company of some merchants he embarked for Suvarṇadvīpa in a large boat. The voyage was long and tedious, extending over thirteen months during which the travellers were overtaken by fearful storms. At this time Suvarṇadvīpa was the head quarter of Buddhism in the East, and its High Priest was considered as the greatest scholar of his age. Dīpaṃkara resided here for a period of twelve years in order to completely master the pure teachings of the Buddha of which the key was alone possessed by the High Priest. He returned to India accompanied by some merchants in a sailing vessel visiting Tāmradvīpa and the island of forests on his way. Returning to Magadha he sought the company of eminent sages, such as Śānti, Naroṇānta, Kuśala, Avadhuti Tombhi and others.

The Buddhists of Magadha now acknowledged him as their chief and unanimously declared him to be the "Dharmapāla" or the hierarch of Magadha. During his residence at the shrine of Mahā Bodhi at Vajrāṇa he thrice defeated the Tīrthika heretics in religious controversy, and thereby maintained the superiority of Buddhism over all other religions in Magadha. At the request of king Nyāya Pāla he accepted the post of High Priest of Vikramaśīla. At this time Magadha was in-

vaded by the king of Kárnya (probably Kánaúj). Nyáya Pála's armies suffered several defeats at the hand of the enemies who advanced near the capital. The Magadha king sued for peace, and a treaty was signed by which friendship was established between the two kingdoms. In this treaty Dípaṃkara took an active part. It was he who reconciled the king of Kárnya to Nyáya Pála.

He visited Tibet in the year 1038 A. D., accompanied by his brother Vírýachandra, Rájá Bhúmi-Saṃga, and Nag-tsho Locháva. The king of Tibet gave him a most cordial reception and commanded his people to receive his teachings with profound veneration. Finding that Dípaṃkara was the best and wisest of the Indian pandits whom he and his father had ever asked to visit Tibet, the king out of reverence for his deep learning and purity of morals gave him the name of Jovo Atíśa (the Supreme Lord who has surpassed all). Arrived at Tholing Dípaṃkara preached the profound doctrine of the Maháyána doctrine and wrote several works on the principles and cult of the general and esoteric branches of Buddhism among which Bodhipatha Pradípa is pre-eminent. In short he revived the practice of the pure Maháyána doctrine by shewing the right way to the ignorant and misguided Lamas of Tibet, who had all become Tautriks. He cleared the Buddhism of Tibet of its foreign and heretic elements which had completely tarnished it, and restored to it its former purity and splendour. Under his guidance the Lamas of Tibet discovered what is called the "real and sure path of the exalted excellence." After a residence of thirteen years which was distributed over the different parts of Tibet, during which he assiduously devoted himself to the propagation of pure Buddhism, enjoying uninterruptedly the good will and veneration of the people, Atíśa died at Nethang near Lhasa at the age of seventy-three in the year 1053 A. D. He is remembered with deep veneration all over high Asia or wherever the Buddhism of Tibet prevails. He was the spiritual guide and teacher of HBromton the founder of the first grand hierarchy of Tibet.

Dípaṃkara wrote several works and delivered upwards of one hundred discourses on the Maháyána Buddhism. The following names of his works occur in *mdo* 𑎎𑎢𑎣𑎠 of *Betan hgyur*.

1. { Bodhipatha pradípa.  
      { བྱང་ཆུབ་ལས་གྱི་སྒྲོན་མ་
2. { Charyá saṃgraha pradípa.  
      { སྒྲོན་པ་བསྟུས་པའི་སྒྲོན་མ་
3. { Satya dvayávatára.  
      { བདེན་པ་གཉིས་ལ་འཇུག་པ་



4. { Madhyamopadeśa.  
དབུ་མའི་མན་ངག་
5. { Sangraha-garbha.  
སྒྲིང་པོ་བསྐྱུ་བ་ ●
6. { Hṛdaya niśchita.  
སྒྲིང་པོ་ངེས་པར་བསྐྱུ་བ་
7. { Bodhisattva manyāvalī.  
བྱང་ཆུབ་སེམས་དཔའི་ཁོར་བུའི་ཕྱོང་བ་
8. { Bodhisattva karmādimārgāvatāra.  
བྱང་ཆུབ་སེམས་དཔའ་ལས་དང་པོ་བའི་ལམ་ལ་འཇུག་པ་
9. { Śaraṇāgatādeśa.  
སྐྱབས་སུ་འགྲོ་བ་བསྟན་པ་
10. { Mahāyānapatha sādhana varṇa saṃgraha.  
ཐེག་པ་ཆེན་པོ་ལས་གྱི་སྐྱབ་ཐབས་ཡི་གེར་བསྐྱུས་པ་
11. { Mahāyānapatha sādhana saṃgraha.  
ཐེག་པ་ཆེན་པོའི་ལམ་གྱི་སྐྱབ་ཐབས་ཤིན་ཏུ་བསྐྱུས་པ་
12. { Sūtrārtha samucchedhayopadeśa.  
མདོ་མཐའི་དོན་ཀུན་ལས་བདུས་པའི་མན་ངག་
13. { Daśakuśala karma pāda deśa.  
མ་དགེ་བ་བཅུའི་ལས་ཀྱི་ལམ་བསྟན་པ་
14. { Karma Vibhaṅga.  
ལས་ཅོམ་པར་འབྲེལ་བ་
15. { Samādhi sambhāra parivarta.  
དྲིང་ངེ་འཛིན་གྱི་ཚོགས་ཀྱི་ཁུའྲུ་
16. { Lokottarāṅgasaptaka vidhi.  
འཛིག་དྲེན་ལས་འདས་པའི་ཡན་ལག་བདུན་པའི་ཚོག་
17. { Guru Kriyākrama.  
སྤྲ་མའི་བྱ་བའི་རིམ་པ་

18. { Chittotpáda samvara vidhi krama.  
 { སེམས་བསྐྱེད་པ་དང་སྒྲུབ་པའི་ཚེ་གཞི་རིས་པ་
19. { Sikshá samuchchaya ábhi samaya.  
 { བསྐྱེད་པ་ཀླན་ལས་བདུས་པའི་སྒྲིལ་པར་རྟོགས་པ་

This was delivered by S'rí Dharmapála the king of Suvarṇadvípa to Dípaṃkara and Kamala.

20. { Vimala ratna lekhana.  
 { རི་མ་མེད་པའི་རིན་པོ་ཆའི་སྒྲིན་ཡིག་

This last is an epistle addressed by Dípaṃkara to Nyáyapála, the king of Magadha.

*Place and River-Names in the Darjiling District and Sikhim.*—By L. A. WADDELL, M. B.

*Facility for finding etymology of names in this area.*—The manner in which place-names are assigned in Sikhim, Eastern Nepál and Western Bhotan, and also in Southern Tibet, can be ascertained with unusual facility and certainty by a local review of place-names in the Darjiling district, Native Sikhim and British Bhotan, owing to the great majority of the villages therein, having been founded within the present generation by migrant Sikhimites and Bhotiyas and immigrant Nepális and Tibetans, under the Government policy of quickly peopling these hitherto sparsely populated tracts; so that the reasons for the special nomenclature of such new sites and villages are still currently known by the villagers. And, the etymology of many of the river-names and older place-names can be more or less readily traced owing to the still existing-presence of the race of Lepchas—believed to be the autochthones of the area. The relative simplicity of the subsequent ethnic elements, all of which are still represented, also tends to simplify the problem.

*Desirability of fixing the Lepcha etymology as the language is becoming extinct.*—The present time, too, seems specially indicated for investigating this subject, from the fact that the Lepcha, though still a living language, is fast becoming extinct; and no vocabulary of the language having been published\*, the names which the Lepcha race has given to

\* Mr. Hodgson published (*Essays*, London reprint, 1874) a short list of Lepcha words, and several words are to be found scattered through Colonel Mainwaring's *Grammar of the Rong (Lepcha) Language*; but these are quite insufficient for the present enquiry.

the rivers and the mountains and other sites in Sikhim, although remaining as ethnological landmarks, might, through much longer delay, prove wholly unintelligible, through their meaning becoming lost.

In my attempt to fix the etymology of some of these Lepcha names, I have to confess to the difficulty of the task in the absence of any vocabulary; but I have spared no pains in the endeavour to trace the exact meaning of the various roots by the help of the few more-intelligent Lepchas available (of literate Lepchas there are now none), and by local enquiry at most of the several spots during the past two or three years.

*Ethnic history of Sikhim.*—A reference to the ethnic history of Sikhim itself is necessary in essaying the discovery of the system adopted by its inhabitants in naming places within its area. And first of all as to the limits and position of Sikhim.

*Sikhim defined.*—Sikhim forms a narrow oblong tract in the south-eastern Himalayas and sub-Himalayas, wedged in between Nepál on the west and Bhotan on the east, and bounded on the north by Tibet and on the south by the plains of Bengal. Its position is peculiarly isolated, it being separated from Nepál and Bhotan by high wall-like ridges, from Tibet by the snows, and from Bengal by the dreaded Tarai jungle.

*Darjiling district defined.*—The Darjiling District consists mainly of 'British Sikhim,' i. e., the southern third of Sikhim, including the Sikhim Tarai (or Morang), the plains skirting the foot of the hills. To this tract was added, as a result of the Bhotan war of 1862, a slice of the hilly portion of western Bhotan from the Tista eastwards: the remainder of 'British Bhotan' is the *tarai*-tract known as the 'Dwárs' and a strip of hill territory in the neighbourhood of the British frontier-posts of Buxa and Dewangiri, which for administrative purposes are included in the Jalpaiguri District and Asam.

*The Lepchas.*—As above stated, the Lepchas are believed to be the aborigines of Sikhim. Their own tradition, which, is very vague, credits them with having entered Sikhim about 500 years ago.\* As, however, they preserve the tradition of a great local deluge,† it is probable that their entry was much earlier than this. The peculiarly

\* Col. Mainwaring in *Introduction to Grammar*, p. x.

† This tradition is a somewhat circumstantial account of the flooding of the country by the Great Rangit river, quarrelling with its spouse the Tista and refusing to go with her to the plains. The waters rose as high as 'Rangli Rangliot' (q. v.), i. e., over 4000 feet above the present level of the river, and even Mt. Mainom the sister of Tendong was submerged, Tendong saving the inhabitants only by raising himself above the waters. The quarrel was ultimately mended and the pent-up waters fell. There are so many side-stories bearing on this great deluge, that it is almost certain that a great local flood actually happened here, by a vast landslide (volcanic or otherwise) damming up the waters for a time.

isolated position of Sikhim and its inhospitable nature can account for its comparatively late occupation. The term 'Lepcha' is, like the current name for their country (*viz.* Sikhim), of Nepáli origin and uncertain meaning.\* The Lepchas call themselves *Rong* which in their vernacular means a 'squatter' or 'care-taker,'† and the country they call '*Ne láyang*' or 'the country of caves,' *i. e.*, for shelter. By the Bhotiyas (Tibetans) they are called Môm-bô (Mon-pô) and Mō-rî (Mon-riks), *i. e.*, 'Inhabitants of the Mon Valleys' and 'Mon tribe'. The Lepchas seem to have preceded the Bhotan Bhotiyas in the *trans-Tista* (British Bhotan) portion of the Darjiling District, as most of the mountain and river-names there are of Lepcha origin.

*The 'Sikhim-Bhotiyas' or 'Sikhim-Tibetans.'*—The next ethnic element was an influx of Tibetans from the Tsang province of Tibet immediately to the north of Sikhim. The date of this immigration is fairly well known—it occurred about 400 years ago.‡ These Tibetans promptly usurped the sovereignty and became the dominant race, and the present 'rájá' of Sikhim is about the 10th or 11th of this series of Tibetan chiefs. The routes by which they entered are still called '*the great pass*' (La-chhen), and '*the short pass*' (La-chlung). Although they intermarried freely with the Lepchas and still do so to a considerable extent, they awarded them a very low social position; and so unfashionable and effete has the Lepcha race now become that the Lepchas seek self-effacement by intermarriage with Bhotiyas and Limbus, and so are fast contributing to the speedy extinction of their own race. These Tibetans of Sikhim are by the Nepális called Sikhim Bhotiyas. It is desirable here to define the terms 'Bhotiya' and Bhotan as they are frequently confused and misunderstood. The native name of Tibet is written *Bod* and pronounced *Pöf*. The Sanskrit form of this word was *Bhot*,§ and its inhabitants by all the Sanskritic speaking races of India are called *Bhotiya* (also written *Bhutiya*) which is synonymous with *Tibetan*—'Tibet,' the current European form, being believed to be merely the Persian or Tartar

\* The Nepális pronounced the word 'Lapche' which is the true pronunciation. It is said to be a contemptuous term, and is possibly derived from the Parbatiya *lab + che* = 'the vile speakers.' The Lepchas, unlike the Limbus and other neighbouring tribes of apparently cognate origin did not adopt the Parbatiya language.

† And their explanation is, that they were originally given this country by God to take care of. It is unlikely that this name is derived from the Tibetan *rong*, 'a valley,' as the word does not seem exotic. It is probably related to their legend of Mount Ten-dong, *q. v.*

‡ Mainwaring, *loc. cit.*, p. x.

§ Hodgson believes that the Tibetans derived the name of their country from the Sanskrit appellation through the early Indian Buddhist missionaries.—*The Language &c. of Nepal and Tibet*, p. 22. This, however, is doubtful.

form of the same word *Pöť*.\* The country generally known in India as Bhotan† was so called by the Bengalis in the belief that it was 'the end of Bhot,' which is the literal meaning of the full Sanskrit form of the word, *viz.*, 'Bhotánta.' The natives of Bhotan as well as of Tibet proper are also by Hindus called Bhotiyas as being inhabitants of Bhot. It is therefore to be remembered that the terms Bhotiya and Tibetan are synonymous, the various divisions being designated by prefixing the name of the country in which the Bhotiyas are now settled, *e. g.*, Sikkim-Bhotiya, Nepáli-Bhotiya, Bhotan or Dharma-Bhotiya, Tibetan and Chinese Bhotiyas.

*The Limbus.*—More peaceful intruders were the Limbus‡ a Mongoloid race from the adjoining hills on the west. These like the Sikkim Bhotiyas intermarried, and still do so, to a considerable extent with the Lepchas. They, however, had a superior civilization and formed settled abodes. Latterly, they have generally given up Buddhism in favour of a rough form of Hinduism, and have adopted the dress and to a large extent the dialect (*Parbatiyá*) of the Nepáli highlanders.

*The Nepális or 'Paháriyás.'*§—These three tribes, *viz.*, the Lepchas,

\* E. Coleborne in *J. R. G. S.*, Vol. I, Supp., I, p. 98, says "A Tibetan arriving in Ta-chien-lu from Lhasa on being asked from what country he has come will often reply 'from Teu Peu', meaning from High or Upper Tibet. Perhaps Teu Peu is the source of our Tibet." The word should properly be spelt Tü-püt, which fairly approximates to our '*Tibet*.' L. A. W.

† The natives and all Tibetans call this country 'Duk-pa' (*hbrug-pa*) which literally means 'the thunderer,' evidently, it seems to me, on account of the unusual amount of thunder experienced here; as the mountains of the greater part of the tract receive the full force of the monsoon from the top of the Bay of Bengal. The Lamas on the other hand assert that the name is derived from the Duk-pa sect of Lama and implies the worship of the thunderbolt which is so peculiar to Bhotan Lamaism: the name of thunderbolt, however, is '*dorje*' not '*duk*,' and the name may more probably be merely a result of the worship of the (for Tibetans) striking and somewhat mystic natural phenomenon (thunder characteristic of this area. And this view is supported by the vernacular history of Bhotan—the '*Namtharkyi Nag-wang-ten-dain Nam-gyal*'—which translates the title '*hbrug-pa*' (*i. e.* Dukpa) into Sanskrit as *megha-swara* or 'cloud-voicé.'

‡ So called by the Nepális; they call themselves *Yák-thumba* (or *Yák-hords*), and the Lepchas and Bhotiyas call them *Tshong* (which in the vernacular means 'a merchant'; and the Limbus were and still are the chief cattle-merchants and butchers in Sikkim, and cattle was the chief form of exotic merchandise until the British occupation.)

§ It is to be noted that the term '*Parbatiyá*', a Sanskrit word having an identical meaning, *viz.*, 'of or belonging to the hills', is in practice restricted to the *Language*, a Hindí dialect spoken by the *Paháriyás*. And the title of *paháriyá* is confined to those hillmen only who profess Hinduism, and this usually of a most lax type.

Bhotiyas and Limbus, formed the population of Sikkim; and this simplicity of ethnic constitution remained undisturbed (except for a brief incursion of Ghorkhas about the beginning of the present century, the intruders, however, being soon expelled by the British) until the British occupation of Darjiling as a Sanitarium. This latter event, which took place in 1837 was speedily followed by a large addition to the population, consisting mainly of Nepáli or '*Paháriyá*' (Hindí for 'hill-man')\* settlers from Eastern Nepal.† This great influx of Nepális during the past few decades, although comprising very numerous and distinct tribes, (*viz.*, Newars, Kiranti, Murmi, Gurung, Mangar or Magar Khas &c., all more or less Mongoloid in type and until recently each speaking widely different dialects) is from a linguistic point of view practically homogenous, from the great majority of these tribes having adopted the Sanskritic '*Parbatiyá*' dialect along with the Hindú ceremonial of their Gorkháli rulers.

*The Bhotan Bhotiyas or Duk-pa.*—The portion of Bhotan annexed to the Darjiling district in 1862 had previously contained only a very few settlements of Bhotan Bhotiyas (or '*Duk-pa*') and Lepchas. This tract being also thrown open to emigrants, a large portion was soon occupied by Nepális, and a not inconsiderable number of refugees from independent Bhotan, and a few Tibetan Bhotiyas or *Pö-pa*.

*Simplicity of the linguistic elements.*—Linguistically then, there may be considered to be, and to have been, only three generically distinct languages prevalent among the settled inhabitants of Sikkim and the Darjiling district, *viz.*, the (1) Lepcha (or Rong-ring) with

\* So sparsely was Sikkim populated that Dr. Campbell estimated ('*The Oriental*' January, 1874, p. 13) that, at the British occupation of Darjiling, the population of Native Sikkim was not more than 5 to the square mile: in the proportion of Lepchas 3,000, Bhotiyas 2,000, and Limbus 2,000. While in the southern third of Sikkim forming the Darjiling Hill Tract the total population amounted only to about 100! In 1849 the population of the latter area had, by attracting settlers from Nepal, Sikkim and Bhotan, increased to about 10,000, and the Census of 1881 showed the population of the Darjiling district, including the added strip of Bhutan to the east of the Tista, to amount to 155,645, and the 1891 Census brings the number over 200,000. The population is still increasing, and Native Sikkim also shares in this increase, although at a much less rapid rate.

† The Gorkhas, now the ruling race of Nepal, derive their name immediately from the town of Gorkha which is about 60 miles W. N. W. from Katmandu (Oldfield's '*Nipal*,' Vol. I), and which formed the first location of their Rájput ancestors in the Himalayas; but this place-name is in its turn derived from the eponymous deity of the now royal family, *viz.*, Gorakhanáth, who seems to be a form of S'iva (Cunningham's *Anc. Geog.*, p. 165). Only a small proportion of the members of our so-called 'Gorkha' regiments are really Gorkhas, the majority are Mangar, Gurung, Kiranti, &c.

which may be included the Limbu dialect which seems structurally allied to it, (2) the Tibetan or Bhotiya, including its Sikhimite and Bhotan dialects, and (3) the Sanskritic dialect (Parbatiyá) of the Nepáli Paháriyas. All these linguistic elements are represented in the local names of the area here discussed; and in addition, in the Tarai is a slight Bengali (Sanskritic) element of recent introduction; and in the hill-tract are several English names designating settlements connected with colonization and British enterprise in the tea-industry, *e. g.*, Hope-town, Bloom-field, Bannock-burn, Birch-hill, &c., but too few to merit special notice.

*Plurality of Place-names.*—The oldest names are found to be of Lepcha origin. The Lepchas from their wild forest life are 'born' naturalists, possessing a name for nearly every natural product, animal or vegetable, whether of economic value or not. Hence they readily gave discriminating names to the chief mountains, rivers and sites in their neighbourhood. A few of these old names still survive in places where the Lepchas no longer are present. The Bhotiyas, on settling in Sikhim, bestowed their own names on many of the already named sites, partly perhaps from the fact that the meaning of the Lepcha name was not evident, and partly to express their contempt for the Lepchas. Thus, many of the hills and rivers possess two names, *viz.*, a Lepcha name and a Bhotiya (Tibetan) name, *e. g.*, the *Riot Ung* and *Rang-nyu Ung* of the Lepchas are the *Dik-chhu*, and *Tsang-chhu* of the Bhotiyas; and the *Kong-ló chu* and *Na-tam chu* of the Lepchas are called *Kang-chhen-dzö-nga* and *Kabur* by the Bhotiyas. And since the influx of Nepális a third synonym in the Parbatiyá dialect of Hindí has been added in several instances for rivers, mountains and already named sites, *e. g.*, *Tista* and *Jalapahár* are the current Paháriyá names for the Lepcha *Rang-nyu Ung* and *Kang-gol hlo*; but such Nepáli synonyms usually are merely corruptions of the Lepcha or Bhotiya names, *e. g.*, the *Rá-dó* of the Lepchas, *Ohumi-chhen* of the Tibetans and *Am-bi-ok* of the Bhotan Bhotiyas are corrupted by the Nepális into *Ladhoma*, *Simik chi* and *Ambek* respectively.

*Orthography employed.*—A few words here are necessary regarding the orthography employed. The current English forms (in maps &c.) of spelling geographical names in this area, as elsewhere, are usually most incorrect and unsystematic: the spelling and pronunciation disagree at every turn, and are out of keeping with the native form, which is the only true one. The system adopted in this paper is the precise method of Sir W. Jones as recognized by the Society, and now generally followed for philological purposes. To adapt it to the complicated vowel-sounds and semi-silent final consonants of the Tibetan, and

the peculiarity that such words are not pronounced directly as they are spelt, the following modifications generally following De Kőrös' system have been introduced :—In transliteration all the words are fully spelt (and not as in Jäschke's method which seems to me too contracted and symbolic), and the silent letters are put in italics. Diacritical marks are only used in the alternative spelling which gives the pronunciation: the letter *ô* has an *aw* sound like the *aw* in *law* and *awful*, it literally represents the spelling in the written form; the vowel sound *é* is as in French, and *ö* and *ü* are as in German; a subscribed dot to a final consonant indicates that it is almost silent. The following Tibetan letters are transliterated thus :—

ཨ = ch.	པ = ph.	ང = ng.
ཅ = chh.	ཨྲ = tsh.	ཉ = ny.
ཐ = th.	ལ = zh.	ན = n.

and the nasal *n* is represented as *ñ*. The Lepcha words are spelt phonetically—their vowel sounds are so very complex and the language so decidedly *tonic* in character, that it is frequently almost impossible to express the exact sound in writing even by compound diphthongs.

*Division of the names.*—In detailing the etymologies of the local names it is convenient to arrange these in groups according to their Lepcha, Tibetan and Paháriya origin; and also to divide the place-names into names of mountains, passes, gompas (monasteries) and village or ordinary place-names.

## THE RIVER-NAMES.

*Of Lepcha origin, the majority.*—In so mountainous countries as Sikkim and British Bhotan the rivers are very numerous. Most of the river-names in Sikkim proper are known only by their Lepcha names to both Bhotiyas, Paháriyas and the English. The Lepchas have no special word for 'river,' but employ instead the word for water, *viz.*, *ung* in a variety of combinations. The Bhotiyas in adopting the Lepcha river-names substitute for the Lepcha suffix *ung*, the suffix *chhu* which has an identical meaning. While the Paháriyas substitute *khola* (which in Parbatiyá literally signifies 'a valley') or *nadí* the ordinary Hindí name for rivers. Thus the *Rang-nyet ung* of the Lepchas is the *Rang-nyit chhu* of the Bhotiyas, the *Rang-gít nadí* of the Paháriyas and the *Rungeet river* of the English.

### *Lepcha River-names.*

The majority of the Lepcha names for rivers contain the prefix *Rang*



which conveys the sense of extension or length\* and is to be met with in other words, e. g., *Rang-gan* = a steep ascent, &c. The following are instances of river-names with this prefix.

**RANG-NYET UNG** = *Rang*, extended, + *nyet*, two + *ung*, water = 'the two extended waters.' There are two rivers of this name, viz, the *Rang-nyet ung mo*, 'the mother, or greater Rangit' and the *Rang-nyet ung kap* or 'the young, or lesser Rangit,' and they form 'the two' principal rivers of Sikkim proper. (The *Tista*, which is of course larger, arises beyond Sikkim).

**RANG-FO UNG** = *Rang* + *fo*, muddy brown + *ung* = 'the muddy brown extended water.' A rivulet arising in the reddish lateritic soil of the low outer hills, and tributary to the *Tista* near Sivok.

**RANG-ZO UNG** = *Rang* + *zo*, precipitous or semi-vertical + *ung* = 'the precipitous river.' A torrent tributary of the *Tista*.

**RANG-RONG UNG** = *Rang* + *rong*, splashing. A tributary of the *Tista* in Sikkim descending throughout greater part of its length over boulders and precipices.

**RANG-PO UNG** = *Rang* + *po*, to shift or wander.

**RANG-GLO UNG** = *Rang* + *glo*, to fall.

**RANG-GUK UNG** = *Rang* + *guk*, narrow and constricted.

**RANG-NOŃ-UNG** = *Rang* + *noŃ*, to go straight.

**RANG-FOK UNG** = *Rang* + *fok*, to be incised deeply.

**RANG-NYU UNG** = *Rang* + *nyu* = queen, 'the queen river' as it—the *Tista*—is the Spouse of the great Rangit. *Nyu* is also said to be a contraction for *nang-yü*, i. e., 'straight-going.' Where the *Tista* receives the Great Rangit, the chief river of Sikkim, which joins it at a right angle, the *Tista* continues in its straight unaltered course, its direction being unaffected by this great accession of waters, hence is attributed its Lepcha name. It is more likely, however, that it is so-called on account of its straight arrow-like course *after leaving the hills*, in contradistinction to the other great effluent river of Sikkim (the *Mahaldi*) which means 'the bent moving water'. Another possible derivation is from *a-nyung* = deep; the *Tista* being the deepest river in Sikkim and always unfordable.

Other river names containing this prefix are *Rang-bi* (= *bik*, to tear asunder), *Rang-mo*, *Rang-li* and *Rang-fap*, &c.

A few of the rivers share the prefix *ra* in common:—

\* Another possible, though not very probable, derivation is from *Dang* = to run, i. e., + *ung* = running waters; *d* is frequently converted into *r* by the Lepchas—but this particular word in the colloquial is not subject to such change.

**RA-THONG UNG** = *Ra*, surging and tumultuous advance, + *thong*, to swallow or drink up. The main source of the Rangit, and a glacier-fed rapid torrent subject to sudden and destructive flood.

**RA-DÔ UNG** = *Ra*, (as above) + *dô*, a lake. The river arises from a small lake called '*Kala pokh'ri*', or the black lake' by the Nepâlis and *Ung-Dô* by the Lepchas.

**RA-MITH UNG** = *Ra* + *mith*, dust or grit. Arises in the lower slopes below Birch Hill and is turbid.

**RA-MOM UNG** (*Pahariya* '*Ra-mâm*') = *Ra* + (?) *Mong*, a demon, the name of the lake—*Mong-dô*—whence this river rises, beyond Phallut. (As an alternative derivation *mom* = incomplete, somewhat, in the sense of the Latin *sub*).

Other rivers are named :—

**RO-LO UNG** = *Rol*, tortuous.

**RÍ-LÍ-UNG** = *Ril*, to revolve or turn round.

**RÍ-RÍ UNG** = *Rí-rí*, swift or rapid.

**RÍ-YOT UNG** = *Rí*, rapid + *yot*, let loose, or unlimited. An extremely rapid river called by the Bhotiyas the *Dik-chhu* (q. v.).

**RÍ-SHÍ UNG** = *Rí*, + ? *shiap*, whirling. A rapid mountain torrent.

**RE-ING UNG** ('*Raing*' of map) = *Re-ing*, to spread out, or be shallow. A shallow and broadish rivulet in the outer hills near Sivok.

**MA-HAL-DÍ UNG** (corrupted by Bengalis and Paháriyas into '*Mahanadí*' or '*Mahananda*') = *Má-hal*, bent or curved + *dí* to move. This river, as seen from the hills, takes a very sudden bent to the right on reaching the plains; and seems so-called in contrast to the *Rang-nyu Ung*, i. e., 'the straight river,' the Lepcha name for the other great effluent river of Sikkim, viz., 'the Tista'.

#### *Bhotiya River-names.*

The Sikkim-Bhotiyas exhibit much poverty of invention in naming their rivers. When not directly borrowing the Lepcha name, which is the rule, they usually name the stream after the mountain whence it arises, or after the chief village or pass near which it flows. For example :—

**LA-CHHEN CHHU** = ལ་ la, a pass + རྩོམ་ chhen, great + རྩ་ chhu, water: 'the water of the great pass.'

**LA-CHHUNG CHHU** = la + རྩོམ་ chhung, small + chhu: 'the water of the small pass.'

**RÍ-TSE CHHU** = *Rí-tse*, the name of the hill + chhu.

**RONG-LI CHHU** = *Rong-lí*, a Lepcha's house + chhu. At the ford or bridge over this river was encountered the first Lepcha's house on the way from Tibet.

As a result of this loose style of nomenclature, the same river possesses different names at different parts of its course, *e. g.*, the Lachhung is called the 'Yum-thang chhu' and 'Mome chhu' opposite these two villages.

Exceptions to this practice are had in the following amongst others:—

DIK-CHHU = དུག dig (pr. *tik* or *dik*), staggering or reeling + chhu.

A snow-fed stream which in a rocky bed descends about 10,000 feet in a course of about twelve miles.

RÍ-ZE CHHU (Ang. Rishi) རི་རེ་rí a mountain + གཙར་gzar (pr. *zé*) a torrent. A mountain torrent crossed on the way from Tibet.

TSÁNG-CHHU = གཙང་gtsang, pure + chhu: 'the pure water'—the Bhotiya name of the Tista, deriving the name from its property possessed in common with all large rivers of tending to become quickly *purified* from defilement.

LE-TÍ CHHU = ལེ་ཏི་le, to twist or plait + ལྷཀྱ་ལྷཀྱ་hkhrīb (pr. *tí*), to twist or coil.

RO-RO CHHU = རྩ་རྩ་roḱ-roḱ, black or gloomy.

LAKES are neither large nor numerous in this area, but such as do exist have usually mythological names and are believed to be the spouses of the hills in the neighbourhood. A small lake on Lebong Spur which was filled up last year in preparing the Station polo-ground was called *Me-long tshó* or 'the mirror-lake'. Another lake valley is called *Ohhu lonḱ-yo*, said to mean, 'a spoon of water'.

#### *Nepáli (Parbatiyá) River-names.*

The Paháriyas have accepted the Lepcha and Bhotiya names for the rivers within the hills, but have usually contorted these names by mispronunciation to an almost unrecognizable extent: *e. g.*, the 'Ra-dó' and the 'Kale' of the Lepchas have become the Ladhoma and Kulhait of the Paháriyas.

The small hill streamlets are called by them *jhorá* from the *Skt.* ज्वर, *jhara*, a cascade or water-fall, from the root *jha*, to waste. These *jhoras* are individualized by being named after the adjoining village, or the special use they are put to, *e. g.*, *Dhobi-jhora* (H. धोबी *dhobí*, a washerman) = 'the washerman's stream'; *Kák jhora* (H. काल *kák* a crow) 'the crow's brook', near the municipality rubbish-heap at Darjiling, where crows and kites congregate. When a hill-stream is subject to very sudden and violent outbursts, it is called *Paglá jhora* (H. पगला *paglá* insane or mad) 'the mad stream,' on account of its furious and erratic behaviour.

As regards the effluent rivers which debouch on the plains, the Paháriyas have accepted the current Bengali names for these, *viz.* :—

**TÍSTA.** The Sanskrit form of the name is *Tri-srota* (*Skt.* त्रि + श्रोत) = 'the three currents.' The Tísta, until the year 1787 A. D., when it suddenly forsook its old bed and opened for itself a new channel, on emerging from the hills divided into three portions named the Atrai, the Púrñabhadra and the Karotoya rivers, which each followed independent courses to the Ganges and the Brahmaputra respectively. The name is of very old application, being mentioned as the *Tri-srota* in the Puráṇas; and as this name well described its leading physical feature in the plains, and under the Prákrit rules the *r* of compound consonants is dropped in ordinary speech, thus forming 'Tísota' or 'Tista'—this seems to be its true etymology. An alternative etymology might be suggested, *viz.*, *Skt.* तृष्ट, *trishṭa* = 'harshly sounding'; but in the deltaic portion of its course this is not a character of its slow-flowing waters, and the literate Bengalis had no access to its course within the hills.

**MAHANANDA.** This is the Bengali corruption of the Lepcha name *Mahal-di*, which name, as already shown, describes the most obvious feature of this river suddenly *bending* away to the right. The letters *l* and *n* are always interchangeable in speech, but after having made this interchange, as no plausible interpretation could be put on such a word, the Bengalis, and following them the Paháriyas, usually pronounce it '*Mahánadi*,' *i. e.*, 'the great river,' although its size does not warrant such a title.

**BÁLASAN** or **BÁLASON** is the Bengali name for the plains-portion of the Rishi Chhu of the Sikkimites. It is believed to be derived from the Bengali बालि, *báli* (*H.* bálu) sand, + शोण, *sona*, gold, with reference to its extensive bed of yellowish sand.

**MECH** or **MINCH**, the remaining *morang* (tarai) river (excepting the Chenga) is said to be so named from being the western boundary of the tribe, called by Bengalis *Mech* and by themselves *Bodo*—the semi-aborigines of the *morang*.

### THE MOUNTAIN-NAMES.

The mountain names are mainly of Lepcha and Bhotiya origin. The names of the snow-clad peaks are almost wholly Bhotiya (Tibetan); as the Lepchas affect the lower levels and the valleys; while the Bhotiyas usually keep to the cooler heights, and were brought into

constant relation with the higher peaks and passes in their commercial and religious intercourse with transnivean Tibet. The Paháryas have no name for the individual snow-peaks, but call them collectively 'Himál' from *Skt.* हिम *hima* snow, + आलय *ālaya*, house = 'abode of snow'; or 'Dhauḷa giri, *Skt.* धवलय, + गिरि 'white mountain' (= 'Mont Blanc.')

*Lepcha names of Mountains.*

**SHIN-SHEL HLO** (*Ang.* Senchul) = *Shin*, cloud and mist-enveloped + *shel*, to be wet or dank + *hlo*, a mountain = 'the damp misty hill.' This mountain overlooking the plains receives the full force of the monsoon and is cloud-capped for the greater part of the year, so as to have been abandoned as a military site for the very qualities designated by its Lepcha name.

**MA-HAL-DI RAM** = *Mahaldī*, name of river above described, + *ram*, the source or fountain-head = 'the head of the Mahaldī' river.

**SA-THONG HLO** (*Ang.* Sitong) = *Sa-thong*, a tiger + *hlo*, a hill = 'tiger-hill.' A hill near Kursiong overlooking the tarai and still frequented by tigers.

**KUNG-GOL HLO**, the Lepcha name for Jalapahar = *Kung*, a tree + *gol*, fallen or upset. The appearance from above is that of a prostrate tree: Birch Hill and Lebong Spurs being the main branches, and the smaller spurs the branchlets.

**FOK-LUT** (*Ang.* Phallut) = *Fok* to be excoriated or denuded + *lut*, an elevation or peak. This peak is so called on account of its top being bare of forest (being above the limit of trees), giving the appearance of being stripped or peeled of forest.

**SING-LE HLO** (*Ang.* Singelah) = *Sing-le*, a kind of alpine Alder (*Alnus vel Betula*, sp.). A steep mountain on the Nepal frontier beyond Phallut crowned by Alder trees.

**TUN-PONG** or **TÜN-RONG** (*Ang.* Tendong) = *Tün*, to heap or raise up + *rong*, a horn; also *Tung rong*, = a ladder. A sub-conical mountain, which tradition asserts arose like a horn from amid a local deluge, and so enabled the Lepchas to escape being drowned. Their tribal name of *Rong* may perhaps be associated with this legend.

**MA-NOM** (*Ang.* MAINOM) = *Ma*, mother + *nom*. sister. 'The elder sister' of Tendong.

**SA-BAR KAM** (*Ang.* Subarkum) = *Sa-bar*, the musk-deer, + *kam*, an overhanging rock. Formerly a favourite haunt of musk-deer, between Sandukfu and Phallut.

KONG-LÔ CHU = *Kong*, highest or pre-eminent + *lô*, a screen or curtain + *chu*, snow and rocky mountain : 'the highest curtain of the snows.' The Lepcha name for Kangchhen-dsö-nga (*Ang.* Kanchinjunga) which is worshipped as a god.

NAN-TAM CHU = *Nan*, level + *tam* cut away, truncated (also *tâm* a plain) + *chu*. The Lepcha name for Kabru or Kabar: describing the peculiar truncated appearance of that mountain as seen from the greater part of Sikhim proper.

PAN-DIM CHU = *Pan-dim*, a king's minister (derived from *pa-no* a king). A high sub-conical peak, which is considered to be an attendant on the god 'Kanchinjunga.'

TA-SING BLÜ = *Tasing*, ? ..... + *blü*, a ridge.

### *Bhotiya Mountain-names.*

KANG-CHHEN DSÖ-NGA (*Ang.* Kanchinjunga) = མངས་ཆེན་ལྗང་མཚོ་ chhen, great + མངས་ཆེན་ལྗང་མཚོ་ mdsod, a repository or ledge + ལྗང་ lnga, five = 'the five repositories of the great snows,' referring to the 5 peaks of this, the second highest mountain in the world, which is an object of worship to both Bhotiyas and Lepchas.

FYUM-GANG = *Fyum* a kind of bambu (*Thamnocalamus*, sp.) + སྐྱུང་ sgang, a ridge. Hooker noted\* the appropriateness of this name.

CHUMO-HLA-RI = ཆོམོ་ལྷ་མོ་ jomo, a lady + ལྷ་ hla, god + རི་ ri, a mountain = 'the goddess mountain.'

KANG-CHHEN GYAO (*Ang.* Kanchinjaw) = Kang-chhen + རྩ་ལོ་ rgya-wo, *pr.* gya-o, bearded, with reference to its monster icicles.

SAN-DUK-PHU. This is interpreted by Lama Ugyen Gyatsho, whom I consulted regarding several of the Tibetan names, as བསམ་ bsam, meditation + རྒྱུ་ grup, to obtain + ཕུ་ phu, a height = 'the height or cave on which wishes by meditation will be obtained.' This mountain, however, is not called 'Sam-dup-phu,' nor has it reputed sanctity or any sacred spot. I believe that the name is derived from རྩ་ rtsa, a plant + དུག་ dug, poison + phu = 'the height of the poison plant.' Here aconite and poisonous rhododendron are so abundant that all the sheep and cattle are muzzled while crossing this mountain; and it is a peculiarity of the Sikhim and Tsang dialect of Tibetan that a final *n* is frequently introduced as an affix to the first syllable

where absent in the written Tibetan\*; thus *tsa-duk* becomes *tsan-duk*.

NAR-SENG = སྒ་ sna, a nose + རྩོང་ seng, uplifted. 'The uplifted nose,' descriptive of the appearance of the mountain as seen from lower Sikkim.

FA-LI-LUNG = ཕལ་ལྷི་ pha-li, a large shield + རྩུང་ lung, wind = 'the shield of the winds.' This high ridge tends to shield lower Sikkim from the S. W. monsoon.

RÍ-NAK (*Ang.* Rhenock) = རི་ rí, a hill + རྩ་ nag, black. The soil of this hill is a very black humus.

RÍ-TSE (*Ang.* Rishi) = རི་ rí + རྩེ་ rtse, summit = 'the hill top;' the path leads over the top of the hill.

CHHORTEN-GANG = mchhod rten, a chaitya + sgang = 'the chaitya ridge.'

PÖ-GA GANG = *Pö-ga*, the sal tree + sgang = 'the ridge of sal trees'.

RÍ-SUM = རི་ rí + རྩུམ་ gsum, three = 'the three hills'; at this site three ridges unite.

RÍ-ZHAP (*Ang.* Rishap) = རི་ rí + རྩམ་ zhaps, a foot = a site at foot of the Himalayas.

LUNG-THU (*Ang.* Lingtu) = རྩུང་ lung, a mountainous valley + ཐུ་ thur, a steep descent. This mountain presents an unusually steep descent to the valleys. Many of the Bhotiyas call this hill *Lung-tong* རྩུང་ཐོང་, i. e., 'the deserted mountain valley.'

PANG-KA-SHA-RI (*Ang.* Pankhasari) = རྩམ་ spang, pasture + ཀ་ཤ་ ka-sha, a kind of grass + ri. 'ka-sha pasture-land.'

DÁ-LING = མདུཌ་ mdah, an arrow + gling. A subconical (arrow-head like) hill. Formerly a strong frontier fort of the Bhotanese.

BAR-NYA (*Ang.* Barmi) = རྩམ་ hbar, burned + རྩམ་ gnyah, a neck: 'the burned saddle or spur'.

#### *Paháriyá Mountain-Names.*

The Paháriyás generally accept the Lepcha and Bhotiya mountain-names. Amongst the exceptions are the following :—

\* Examples of this in Sikkimite are :—*min-da*, a gun, for the Tibetan me-dah.  
*min-tok*, a flower " " me-tok.  
*mingo*, not wanted " " mi-go.  
*gyám*, fat " " gyak.

And in Tsang-pa dialect of Tibetan an *n* is frequently inserted where the following syllable has, as in this case, an initial *d*; e. g. :—

gan-de (= good) spelt dga-bde.  
 tshan-de (= hot) " tsha-hde.

JALA PAHÁR = H. *Jala*, burned + *pahár*, a hill. 'The burned hill.'  
This accounts in part for the presently bare condition of this hill.

GIDHA PAHÁR = H. *Gidh*, a vulture + *pahár*. 'The vulture's hill.'  
Here great numbers of vultures infest the rocky cliffs overlooking the plains.

### THE PASS NAMES.

The names of the mountain passes are all of Tibetan origin. The term ལ་ *la*, or pass is often loosely applied to the mountain itself. The following list comprises most of the passes :—

DONG-KHYA LA (*Ang.* Donkia) = འབྲང་ *hbrong* (*pr.* *dong*), the wild yak + རྩམ་ལ་ *khyags*, frozen + ལ་ *la* = 'the frozen yak pass.'  
A herd of wild yaks, in attempting to spend the night in this pass (18,100 feet high), were frozen to death.

SÍ-BU LA = སྤུ་བུ་ སྤུ་ *sil-bu*, cold. 'The cold pass'—the greater part of the way is under snow.

THANG-KAR LA (*Ang.* Tanka) = ཐང་ *thang*, a field + དཀར་ *dkar*, white. This pass presents a field-like expanse of snow, all the year round.

JO-LA (*Ang.* Chola) = རྒྱལ་ *lord*. 'The lordly pass,' said to be so called on account of its height and difficult approach. An alternative etymology is མཚོ་ *mtsho*, a lake. Numerous lakes are in this pass.

YÁK LA = གཡག་ *gyag*, the yak (*Bos grunniens*). The pass for herds of yaks into eastern Sikkim.

YUM-TSHO LA = ཡུམ་ *yum* respectful title for 'mother' + *mtsho*. 'The lake of our (holy) mother,'—a nymph who is worshipped here.

RÍ-SHIK LA (*Ang.* Rishi) = རི་ *rí*, mountain + *shik*, slipping or falling. The pass has appearance of a landslide.

YÁK CHNÖ LA = yak + གཤོན་ *gchhor*, tired. A steep pass—a stage for 'tired' laden yaks proceeding above Lachhung.

DSE-LEP (*Ang.* Jelep) = མེད་ *lovely* + ལེབ་ *level*. 'The lovely level pass', with reference to its ease and patency.

NAK-PO or NA-KO LA = རྩམ་པོ་ *nagpo*, black. An unsnowed pass.

KU-PHU (*Ang.* Kupup) = སྤྱི་ *sku*, the body especially of a saint + *phu*, a summit. Tradition relates that the saint Guru Rim-bochhe (*Padma Sambhava*) rested here, in passing to Tibet.



TUK-LA (*Ang.* Tukola) = ཐུག་ལ་ *gtug*, to tear or pluck off. Tradition states that the Pass was created by Guru Rimboche tearing off a portion of the rock to hurl at a demon who infested a lake in the vicinity to the annoyance of passengers.

DÜ-LA = བྱ་ལ་ *bdud* (*pr.* dü) a demon. 'The devil's pass'.

KU-CHAK LA (*Ang.* Quiche) is said to be derived from *ku* a lock, or *kug* crooked = 'the locked pass.' It is a difficult snow-locked pass.

RÔ-BANG LA (*Ang.* Rabong) = རོ་བང་ *rô*, a carcase + བང་ *bang*, a grave. In the pass is an old *mendong* grave-cairn.

LA-CHHEN = la + chhen, 'the great pass.' The longest pass into Sikkim from the Tsang province of Tibet.

LA-CHHUNG = la + རྩ་མུག་ *chhung*, small. 'The short pass' from Tsang into Sikkim.

## NAMES OF GÖMPAS OR MONASTERIES.

Sikkim having derived its Buddhism and civilization from Tibet, its monasteries mostly bear Tibetan names and these usually of an ideal or mystic nature. The word རྒྱུ་པ་ *gdon-pa*, pronounced *gömpa* literally means 'a hermitage,' and the oldest monasteries were, and many of them (*e. g.*, Dub-de, Sang-nga-chhö-ling, Pema-yang-tse, &c.,) still are situated in solitary places; but around some of the others, villages have gradually sprung up, and those of the most recent ones have been founded within villages from which they take their name, which in such cases is usually of Lepcha origin, *e. g.*, Ram-tek, Ling-tâm.

DUB-DE = རྒྱུ་པ་ *sgrub* (*pr.* 'dub,') a hermit's cell + སྡེ་ *sde*, a place. 'The place of the hermit's cell'—the oldest monastery in Sikkim founded by the pioneer missionary Hla-tsün Chhen-bo.

SANG-NGA-CHHÖ-LING (*Ang.* Sangachiling) རྒྱུ་པ་ *gsang*, secret or occult, + རྒྱུ་པ་ *sngags*, spell or magic + རྩ་མུག་ *chhos* religion + རྒྱུ་པ་ *gling*, a place. 'The place of the occult mystic religion.' A catholic Buddhist monastery open to all classes, including deformed persons, nuns, Lepchas and Limbus.

PEMA-YANG-TSE (*Ang.* Pemiongchi) = པད་མ་ *padma* (*pr.* 'péma') a lotus + རྩ་མུག་ *yang*, perfect or pure + རྩ་མུག་ *rtse*, the highest 'the monastery of the sublime perfect lotus (-born one, *i. e.*, *Padma Sambhava*). A monastery open only to pure, celibate,\*

\* This condition is now satisfied by disallowing the residence of priests' wives within the precincts of the monastic establishment.

and undeformed monks (= Tasang) and especially associated with Guru Rimbochhe who is worshipped here.

TA-KA TĀSHI-DING (*Ang.* Tashiding) = བཅོ་ཐག་ brag (= tag,) a rock + དཀར་ dkar, white + བཅོ་ཤི་ bkra-shis (*pr.* tá-shi) glory + རྒྱུང་ lding, a soaring up or elevation. 'The gömpa of the elevated glorious white rock.' The site, a bold high promontory at the junction of and between the Great Rangit and Ratong rivers, is believed to have been miraculously raised up by Guru Rimbochhe, and amongst other traces a broad longitudinal white streak in the rock is pointed out as being the shadow of that saint.

PHO-DANG (*Ang.* Fadung) = ཕོ་བླ་ pho-ltang, a sloping ridge; such is the site of this gömpa and the usual spelling of the name. As, however, this is the 'chapel-royal' of the rájá, it seems possible that the name may be ཕོ་བླ་, pho-dang = palace, 'the gömpa of the palace.'

LA-BRANG (La-brang) = ལ་ bla, a contraction of *lama* or high-priest + བླ་ brang, a dwelling. Here is the chief monk's dwelling. *N. B.*—This is one of the very few words in which *br* is literally pronounced as spelt.

DORJE-LING (*Ang.* Darjeeling) = རྡོ་རྗེ་ rdô-rje 'the precious stone' or ecclesiastical sceptre, emblematic of the thunder-bolt of Sekra (Indra or Jupiter) + གླིང་ gling, a place. The monastery from which Darjiling takes its name, and the ruins of which are still visible on Observatory hill, was a branch of the Dorjeling, usually curtailed into Dô-ling (*Ang.* Dalling) monastery in native Sikkim; and to distinguish it from its parent monastery, it was termed *Wang-dü* Dorje-ling (དབང་ རྡོ་ལྷ་ bdus, accumulated or concentrated) on account of its excellent situation, and powerful possibilities.

DE-THANG = *De*, a kind of tree (*Daphne papyraceae*, Wal.) from the bark of which ropes and paper are made + ཐང་ thang, a meadow = 'the gömpa of the *De* meadow.' Here these trees are abundant.

RÍ-GÖN (*Ang.* Ringim) = རི་ རྒྱུང་ dgon, a hermitage = 'the hermitage hill.' It is situated near the top of the hill.

TÔ-LUNG = རྡོ་ rdo, a stone + རླུང་ lung, a valley. This valley is remarkably rocky, and avalanches of stones are constantly falling in showers.

EN-CHE = དབེ་ dwen, (*pr.* en), a solitary place + ལ་ lche, a tongue. A monastery on a tongue-shaped spur.

**PHÉ'N-ZANG** = ཕན་ཕུན་ phan, bliss or profit + བཟང་ bzang, excellent. The monastery of 'excellent bliss.'

**KHA-CHÖ-PAL-RI** (*Ang.* Ketsuperi) = མཁའ་པ་ལ་རི་ mkhah, heaven + རྟེན་ spyöd (*pr.* chö) to accomplish or reach + དཔལ་ dpal, noble + ri = the monastery of 'the noble mountain of the Garuḍa (a messenger of the gods)' or 'of reaching heaven.'

**MĀ-NI** = མ་ཎི་ má-ní, a tablet inscribed with 'Om máni &c.,' a mendong. 'The gömpa of the mendong': here the gömpa was erected near an old mendong.

**SE-NÖN** = Se, a sloping ridge + མོན་ nön, depressed. Situation on a depressed sloping ridge. It is also spelt *gzigs* (*pr.* si) seer or beholder, + མཚོན་ mnön, to suppress; and in this regard it is alleged that here Padma Sambhava beheld the local demons underneath and kept them under.

**YANG-GANG** = ཡང་ yang, perfect, also lucky + རྩང་ sgang, a ridge. 'The monastery of the lucky ridge.'

**LHÜN-TSE** = ལྷུན་ lhun, lofty + རྩེ་ rtse, summit. 'The monastery of the lofty summit.'

**NAM-TSE** = རྩེ་མ་ rnam, a division or district + rtse. 'Lofty division' one of the subdivisions of Native Sikkim, on the flank of Tendong. It is probable that this is a Lepcha name from *tsü* = 'Seat of Government,' as the site is a very old Lepcha one.

**TSÜN-THÁNG** (*Ang.* Cheungtham) = བཟླ་བ་མོ་ལྷོ་མེ་ཐང་ btsun, a queen; also 'respected one,' i. e., a lama or monk; also marriage + ཐང་ thang, a meadow. This gömpa is situated overlooking a meadow at the junction of the Lachhen and Lachhung rivers. It may mean 'the meadow of marriage (of the two rivers),' or 'the meadow of the lamas,' or 'the meadow of the lady'—its full name as found in manuscript being བཟླ་བ་མོ་ལྷོ་མེ་ཐང་ btsun-mo rin-chhen thang, implies that the lamas would have the monastery derive its name from 'the precious Lady-(pig)' whose image is prominently displayed within the gömpa.

**RAB-LING** (*Ang.* Rawling) = ར་གླིང་ rab, excellent or high + gling, a place. This monastery is situated on a high cliffy ridge.

**NUB-LING** (*Ang.* Nobling) = འཕྲུ་གླིང་ nub, the west + gling = 'The gömpa of the western place or country.' It lies on the western border of Sikkim.

**DE-KYI-LING** (*Ang.* Dikiling) བདེ་སྐྱིད་ bde-skyid, happiness +

gling = 'The place of happiness.' It is a rich arable site with extensive marwa cultivation.

RIN-CHHEN-PUNG (*Ang.* Ringkingpung) = rin-chhen, precious + pung, a heap or knoll, 'The precious knoll.' The soil is rich and fertile.

. For names of other monasteries see under the heading of Village-names.

## VILLAGE AND OTHER PLACE-NAMES.

### *Lepcha Place-names.*

When the place-name indicates the site of a village the suffix *kyung* or *kyong* = 'village,' is added; and for a site without any existing village *lay-ang* = 'a place or tract' is added.

ALI-BONG (*Ang.* Lebong spur) = *a-li* a tongue + *a-bong*, mouth.

A tongue-like spur of land below Darjiling.

PA-DĀM-TAM (*Ang.* Badamtam) = *Pa-dam*, a large species of bambu (*Dendrocalamus Hamiltonii*, *N. et A.*) from which water-vessels ('chongas') and marwa jugs '*pa-hip*' are made: it grows only below 4,000 feet + *tām*, a contraction for *par-tām*, a level spot. 'The *padam*-bambu bank:' here formerly was a forest, the nearest to Darjiling, of this kind of bambu which is in much demand.

YOKRI-BONG = *Yokri*, India-rubber tree (*Ficus elastica*) here abundant + *bong*, (= Tibetan བཞེ ) a stump or foundation, hence also a residential site. A village founded among (the stumps of felled or simply among) 'rubber' trees.

KANKI-BONG = *Kanki*, the 'padma' tree (*Prunus puddum*, Roxb.) here abundant + *bong*.

KUNG-BONG = *Kung*, a (any) tree + *bong*.

KOL-BONG = *Kol*, a walnut tree, here abundant + *bong*.

PO-BONG = *Po*, a large kind of bambu + *bong*.

NAK-GRĪ (*Ang.* Nágri) = *Nak*, straight + *grī*, a high stockaded fort.

TUNG-SUNG = a stockade.

NAM-FOK = fat + hollow, 'the fat hollow.'

NAM-TSÜ (*Ang.* 'Namchi') = *Nam* fat + *tsü*, Government. 'The Government of the fat site.'

PA-ZOK (*Ang.* 'Pashok') = 'jungle.' Here the dense sub-tropical 'jungle' or forest of the Tista valley commences.

SANA-DA (*Ang.* 'Sonadah') = *Sana*, a bear + *da*, a lair = 'the bear's lair.' Bears are still in the neighbourhood.

TSONG-KYUNG = *Tsong*, the Limbu tribe + *kyung*, a village. A village founded and still mainly inhabited by Limbus.

RANG-MUK = *Rang* + *muk*, weeds. An old extensive clearing, now a tea-garden.

RANG-LOT (*Ang* Rangliot) = *Rang* + *lot*, to return. This is the limit from which the Rangit flood waters returned.

MAHI-MAN-DAP = *Mahi*, (a corruption of Bengali *মহিষ*, *mahish*, a buffalo, + *man*, flesh + *dap* to obtain. A site of a market overlooking the tarai, to which buffaloes were brought up from Bengal and slaughtered for retail of their flesh.

TAK-VÔR (*Ang*. 'Tukvar') = *Tak*, a hook-thread + *vôr*, a fish hook: the land is curved somewhat like this, and the local Lepcha tradition asserts this origin for the name.

SHING-TÂM = *Shing*, a garden + *tâm*, a level spot.

SONG-KHANI = *Song*, copper, + *khâni*, Hindî and Parbatiyâ for a mine. A village where copper ore is mined.

GOK = narrow and difficult (of access): an old military post on a narrow promontory between the Great and Little Rangit and Ramam rivers.

RONG-LÍ = *Rong*, Lepcha + *lí*, a house.

JING-HLÂM or ZHING-HLÂM = *zhing*, weak, or poor soil + *hlam*, sloping. 'The sterile slope.' The soil of this locality has a sterile reputation.

SALLO-KUNG = *Sallo*, name of a kind of tree + *kung*, tree.

UNG-LAP = *Ung*, water + *lap*, a well. Here is a well, a most unusual feature in Lepcha villages, where the usual water-supply is from brooks.

KALÛN-PONG (*Ang*. 'Kalimpong') = *Ká-lin*, a king's minister (a term borrowed from the Tibetan + *pong*, a stockade. This was formerly the stockaded headquarters of a Kalün.

SU-VOK (*Ang*. 'Sivok') = *sü* or *sü-e*, a breeze or rush of cool air + *vok*, concentrated. The mouth of the gorge whence the Tista debouches into plains, and along which a strong breeze is ever present.

TSONG-TONG (*Ang*. 'Chongtong') = ? *Tsong*, an arrow + *tong*, a resting place. An arrow-head-shaped site at junction of two rivers, at an acute angle.

LONG-SONG = *Long*, a stone + *song*, resounding. A rocky site in the resounding gorge of Tista opposite junction with Great Rangit.

PA-KYONG = *Pa*, a kind of cane + *kyong*, village.

LING-TÂM = *Ling*, a slope, or hill side + *tâm*, level spot. A mixture of slope and level.

TING-KAP = *Ting*, a plain + *kap*, little. An unusually (for Sikkim) large meadow.

- RAB-DEN-TSI** = *Rap*, a collection + *a-den*, highest sect of Lepchas + *tsü*, law or government. This was the original seat of the Lepcha *pa-no* (rájá) before the influx of the Tibetan Barfungmos.
- PAYONG-KANG** = *Payong*, a species of bambu (*Cephalostachyum capitatum*, Munro) from which arrows are made + *kang*, a ridge.
- PASHEN-BONG** = *Pashen*, a tree-fern (*Alsophila latebrosa*, Hk.) + *bong*. Tree-ferns are here numerous.
- SILIM** (*Ang.* Selim) = a kind of tree (*Terminalia chebula*, Retz.) abundant at this site, the seeds of which are eaten.
- SUM** (Soom) = a tree (*Phyllanthus emblica*, Roxb.) the fruit of which is eaten.
- SIRIM-PUNG** = *Sirim*, Limbu name for a species of wild citrus + *pung* the Limbu form of *bong*.
- HANG-MÁ-FUNG** = *Hang-má*, Limbu name for a kind of tree with perfumed flowers + *fung*, a flower.
- RAM-TEK** = *Ram*, god + *tek*, gone. Local tradition states that the name was given to the site last occupied by their (Lepcha) chief on his deposition by the Bhotiyas, to express their misfortune.
- YUK-SAM** = *Yuk*, 'a superior' hence a *lama* + *sam*, three. The place of meeting of 'the three lamas' to choose a rájá for the Lepchas.

#### BHOTIYA PLACE-NAMES.

- GANG-THOK** (*Ang.* Guntok) = གང་ལོ་ *sgang*, a ridge + ཐོག་ *thok*, a peak, an eminence. 'The eminent ridge.'
- KAR-THOK** = དཀར་ཐོག་ *dkar*, white + *thok*, 'The white eminence.'
- YANG-THÁNG** = གཡང་ཐང་ *gyang*, a precipice + *thang*, a field, 'the field of the precipice.'—A huge cliff overhangs this meadow-site.
- ZAM-DANG** (*Ang.* Samdong) = བཙུག་ཐང་ *zam*, a bridge + ལྷམ་ཐང་ *hbrang*, a halting place, stage or dwelling.
- MO-ME** = solitary, a site (*circa* 16,000 feet) at the last bridge below the Donkya pass.
- NA-THÁNG** (*Ang.* Gnatong) = ལྷ་ཐང་ *nak*, black (or nags, forest) + *thang*. 'The black meadow,'—the first meadow on this side of the Jelep pass; it is black with pines.
- LABA-BA** (*Ang.* Labah) = ལྷ་པ་པ་ *lhaks-pa*, windy. A breezy site.
- OJAK-KHA** (*Ang.* Iche) = འོ་ཁ་ *O*, the previous name of the village + རྫོང་ཁ་ *jag-kha*, broken. So called after the road had been cut through it, dividing it into two parts.

CHHUM-NAGA, = ohhum, water + naga, a grassy bank.

NAK-TSHAL (*Ang.* Naxal) = नक' nags, forest + त्शल' tshal, a hunting grove.

BAR-FUNG = बर' hbar, burned, + फुङ' phung, a collection or heap or knoll. 'The collection of burned sites or jungle clearings.' The oldest Bhotiya division in Sikkim.

AM-BI-OK = am-bi, a demon's shrine + ओक' og, below. A site below the shrine.

DAM-THANG = दम' gram (*pr.* dam) mud + थङ' thang, a marshy muddy meadow.

BA-KHYIM = ba, a kind of bambu used for making mats + किम' khyim, a house. A house of bambu matting—a halting stage on Tendong hill.

MING-MACHHEN = *Ming-ma*, a kind of bambu + chhen, large.

SEDONG-CHHEN = *Sedong*, name of a tree (*Albizia*, sp.) + chhen, large. Here a halting stage for travellers at a large Sedong tree, an uncommon tree in Sikkim.

PHA-DOM CHHEN = phá-dom, a clearing + chhen. A largish clearing in jungle forming a halting place.

DÔ-LEP-CHHEN = rdo, a stone + लेप' leb, level or flat + chhen. A halting stage at 'a big flat stone.'

CHHUM-MIK CHHEN = chhu-mik, a spring + chhen, big. Here is a large spring.

KYO-SHING (*Ang.* Keuzing) = *Kyo* wheat + shing, field. 'The wheat field.'

TONG-TÖ = टुङ' stong, a valley + स्टुङ' stod, upper. A division of Sikkim comprising an upper valley.

PÖ-DANG (*Ang.* Pedong) = pö or pö-ga, a kind of cypress, also a *Sal* tree, of the gum of which incense is made + डङ' hbrang, (*pr.* dang) a halting-place. 'The halting-place at the Pö tree.'

PA-ZAM-KHA (*Ang.* Buxa) = प' spa, cane + डम' zam, a bridge + ष' kha, mouth. Name of a site at 'the mouth of the cane-bridge' leading into Bhutan.

#### PAHARIYÁ AND BENGALI PLACE-NAMES.

(P = Pahariyá, B = Bengali and H = Hindi.)

LAPCHE-JAGAT = P. *Lapche* the Lepcha + jagat, a toll-bar. A village on the Nepal frontier where the Lepchas levied toll on the Nepáli imports into Sikkim.

SUNGBI-TÁNE = P. *Sungar*, a pig + तार, a jungle clearing. A halting stage of the Nepáli pig-drivers on their way to Sikkim.

SING-BUNG DERA = *Sing-bung*, Limbu for tree-stump + *dera* P. and Hindustání for camp. A wood-cutter's camp.

CHILAUNI = P. *Ohilauni*, a kind of tree with perfumed blossoms (*Schima Wallichii*); here abundant.

KAINJALIA = P. *Kainjal*, a kind of tree (*Bischoffia Javanica*, Bl.); here abundant.

TAKTÁ-BÁS = P. तक्ता *taktá*, a plank + बास *bás*, a habitation. A wood-cutter's village in jungle where planks were stored for transit to Darjiling.

CHÚŃA-BATÍ = P. चुन्ना *chuna*, lime + बत्ती *bátí*, a lamp. A lime-kiln is here.

CHAILÁ-DURA = P. *chailá*, blocks of fire-wood + *dura*, a hut. A settlement of cutters of fire-wood.

BHOTIYA-BASTI = Bhotiya + बस्ती *bastí*, a residence. The Bhotiyas' village.

BÁTÁSI = P. बानासी *bátási*, windy. A breezy site.

SHEPI = P. शेपि *shepi*, to be wet or moist. A new village in a forest clearing where unusually dense dew falls.

MÁŃÍ-GHARA = P. माँडी *máŃí*, mud + घर *ghara*, a house. The first mud-house met with at the foot of the hills (the houses in the hills being built of stone or wood).

NÚŃA-MÁŃÍ = P. नुन्ना *nuna*, salt + *máŃí*, earth. Here is a 'salt-lick.'

CETE-DHÁRA = P. *cheten*, a Buddhist *chaitya* + धार, *dhára*, a ridge. Here on the ridge is a *chaitya*.

GUMTI = P. a turn of the road. Site in the angle of a turn of the road.

PUL-BÁZÁR = Hindust. *pul*, a bridge + P. and H. बाजार *bázár*, a permanent market. A market at bridge over Little Rangit.

JOR-POKHRI = P. जोड़ *jor*, a pair + पोखरी *pokhri*, a small pond. Here are two small ponds.

SUKHÁ-POKHRI = P. सुखा, *sukhá*, dry + *pokhri*. A small semi-dry pond.

KÁLÁ-POKHRI P. = काला, *kálá*, black + *pokhri*. A small pond with dark peaty water.

BAHMAN-POKHRI = B. Bahman, a Bráhmaṇ + *pokhri* = 'The Bráhmaṇ's tank.'

JOR-BANGALÁ = P. *jor*, a pair + *bangalá*, the Bangala (Bengali) style of a European's house. Formerly there were only 'two bungalows' here.

LAMBÁ-DHARA = P. लम्बा *lambá*, long + *dhara*. Here a long ridge.

LÁMÁ-GAON = *Lámá*, superior monk + गाँव *gáŃw*, a village. Formerly a lama's residence.



SIPÁHÍ-DURA (*Ang.* Sepey-dura) = *Sipáhi*, a native soldier + P. *dura*. The 'lines' of the pioneer Sepoys now disbanded.

KUÁ-PÁNÍ = P. कुआ, *kuá*, a well + पानी *pání*, water. No stream near, hence villagers had to dig a well, an unusual source of water-supply in the hills.

GORU-BÁTHÁN = P. गोरु *goru*, a cow + बाथान, *báthán*, from Skt. बस *bas* to dwell + *sthán*, a place. A grazing station.

SÍMANA = P. सीमन, *símana*, a boundary. A village on the Nepal frontier line.

PÁNÍ-GHÁṬA = P. *pání*, water, + घाट *gháṭa*, a ferry or ford. The ford over Balasan at foot of hills.

PÁTHAR-GHÁṬA = H. पाथर *páthar*, a stone + *gháṭa*, a ferry. The ferry on the Mahananda where stones are gathered for road-metal.

SILI-GURÍ = P. and Skt. शिल, a stone + P. *guri* from Skt. गढ़ी *garhí*, a small fort. 'The stone fort.' The furthest out site from the hills where stones are locally available for building.

TARÁI = P. and H. तराइ, *tarái*, a swamp, or marshy tract.

TARIYANA (*Ang.* Tirihana) = a form of above.

DWÁE (*Ang.* Dwar) H. B. and Skt. द्वार *dwár*, a door, or passage. 'The door or entry (to the hills).' The broad shallow valleys leading from plains into the hills.

KAMÁN, the ordinary name used among the hill-coolies for tea-gardens. It seems to be the *Parbatiyá* word meaning 'to earn money,' from the same root as the H. कामना *kamáná* 'to work for hire.'

SANYÁSÍ-THÁN = *Sanyási*, a religious mendicant + B. थान *thán*, 'the place, usually a shrine. Here it is a *Sanyási*'s hut.

DAWÁI-PÁNÍ = B. and H. *dawái* medicinal + *pání* = 'Mineral spring.' Here is a chalybeate spring.

BÁGH-DOKRÁ = B. बाघ *bágh*, a tiger + *dokrá*, roaring. A village in the Tarái in a locality infested by tigers.

BAIRÁGÍ-BHÍTA = B. and H. *Bairági*, a religious mendicant + *bhíta*, a plot of land. 'The mendicant's plot.'

DÁNGAR-BHÍTA = B. and H. *Dángar*, a hill-man + *bhíta*. Here a settlement of some Uraon hill-men.

HÁTHÍ-PÚBA = H. and B. *háthi*, an elephant + पूब *púba*, to immerse. A marshy tract which elephants could not cross.

RÁJÁ-JHAR = H. and B. *Rájá* + जाड़ *jhar*, a jungle. 'The king's forest.'

GHORÁ-MÁRÁ = H. and B. घोड़ा *ghorá*, a horse + *márá*, killed. A local tradition states that a horse was killed here by a tiger.

BHAIṆSÍ-MÁRI = H. and B. बैस *baiṇsa*, a buffalo + मारि *mári*, killing,

MAHISH-MÁRI = B. *महिष*, *mahish*, buffalo + *mári*.

GÁÍ-BÁRÍ (*Ang.* Gayabáří) *gás* or *gái*, cow + *बारी* *bári*, a habitation = cow-shed.

SÁL-BÁRÍ = B. and H. *sál*, the valuable timber tree (*Shorea robusta*) + *bári* = 'The *Sal*-grove.'

ÁLU—, ÁM—, CHAMPA—, KAMLÁ—, PHUL-BÁRÍ = B. and H. *álu*, a yam or potatoe, *ám*, mango, *champa*, the champak-tree, *kamlá* (the citron) tree, *phul*, a flower + *bári*, a habitation—hence as regards vegetables, a grove or garden.

SUKNÁ = B. *सुकना* *sukná*, dry. A dry site in Tarái on plateau at base of a spur where water-level is relatively low.

#### THE GENERAL IMPORT OR MEANING OF THE NAMES.

The above lists of names with their etymological definitions, although not exhaustive, suffice to show the manner in which place and river-names are assigned in this area. The great majority of the names are given by illiterate persons, so that grammatical accuracy is not always to be expected. The names, as to their meaning, may be generally classed as descriptive; a few are mythological and religious, but these are chiefly confined to monastery names; and the personal designations perpetuating the names of the founders of villages are found almost exclusively amongst the Paháriyá settlements.

*Names mostly descriptive.*—The descriptive names predominate, and these usually well express some very obvious physical feature of the site or river, e. g., of rivers, an especial tortuosity, steepness, impetuosity, shallowness or otherwise of a course or channel; of mountains, their shape, appearance &c.; of village sites, the stony, precipitous, meadow-like character, quality of soil, jungle-product, conspicuous tree &c.

*Names of the country.*—In naming the country, both the Lepchas and Bhotiyas characterized the most striking feature of the country, each from their own respective point of view. The Lepchas, a roving forest-people, even still living largely on jungle-products and sleeping under rocks for shelter, called this country Ne-layang or 'the country of caves,' while the Bhotiyas, a much more pastoral and agricultural race, who came from across the Himálayas, where rice is highly prized as food, but not there growable, called the country *འབྲས་ལྗོངས་* *hbras-ljongs*, pronounced Dé-jong\* or 'the rice-country,' as rice is abundantly cultivated in Sikkim. These Sikkim Bhotiyás in the course of the three or four

\* As *de* is a form of *demo* *བདེ་མོ་* = good, although the name of the country is not spelt in this way, it is occasionally called 'Demo-jong,' i. e., 'the happy or good country.'

centuries which have elapsed since migrating from Tibet, have acquired\* a dialect which differs in many ways, but chiefly in pronunciation, from the polite speech now prevalent at Lhasa. One feature of this difference is the tendency, shared in common with the Tsang-pa Bhotiyas of Nepal, and already noticed, to insert a final *n* where such does not appear in Tibetan. The country has thus come vulgarly to be called Dén-jong, instead of Dé-jong, and the people generally call themselves Dén-jong-pa, i. e., 'the people of Den-jong.' And the Lepchas in accepting the name imposed by their conquerors usually pronounce it Ren-jong—*r* being with them frequently interchangeable with the letter *d*.

The etymology of the modern name of 'Sikkim' is not at all so clear. It is generally alleged by the Lepchas and Bhotiyas to be a Parbatiyá name, applied to the country by the conquering Gorkhas. As the great majority of the Parbatiyá words are derived almost directly from the Sanskrit, I venture to suggest that the most probable derivation is from the Sanskrit सिक्किम *Sikkin* = crested: this would characterize the leading feature of the approach from the Nepal side—a long high ridge, with Kanchinjunga 28,000 feet and Kabur 22,000 feet in its middle, separates this country from the Gorkha territory; and being shut off from Bhotan by another high ridge, the intervening narrow tract which constitutes Sikkim presents within itself an unusual number of ridges (crests) running more or less in N. to S. direction, transverse to the vista from Nepal.†

Many of the place-names merely denote halting places or stages presenting a rock-shelter or a clearing in the jungle with water-supply near, and occasionally pasture. These sites, being on lines of communication and always near a water-supply, occasionally develop into villages. These names were probably given by Tibetan merchants or other travellers such as priests or monks. The process of such name-giving might arise through a pioneer merchant or other traveller, narrating the stages of his journey into 'the rice country' (Dejong) and his successors adopting his stages and nomenclature. Such a traveller might be supposed as saying that, on crossing 'the level track pass'

\* In some instances the difference appears due to preservation of ancient forms of speech rather than a new development, or corrupt dialect.

† This name is not at all likely to be related to Skt. शैक, *śaik*, to wet or moisten, for the climate of Sikkim does not appear to be more moist than that of the adjoining portion of Eastern Nepal. Nor does the conjecture seem tenable that it is a Parbatiyá translation of one of the vulgar forms of the Bhotiya name for the country, viz., 'Demo-jong' or 'the happy country' from सुखी *sukhi*, happy; as the name is never spelt or pronounced with *u*, and the country was, and still is, a most inhospitable one.

(Je-lep-la), he passed the 'Saints' mount' (Kuphu) and 'the Guru's defile' \* and reached 'the black meadow' (Na-thang) where he halted. Next day he proceeded down 'the steep descent' (Lung-thu), past 'the big clearing' (Phadom chhen), to the large Sedong tree' (Sedong ohhen). Next day, continuing the descent, he crossed 'the water (chhu) at 'the Lepcha's house (Rong-li) and ascended to 'the big flat stone' (Dô-lep chhen) where he halted. The following day he crossed 'the black hill' (Ri-nak) and 'the mountain torrent' (Ri-ze chhu), and ascended to 'the Pö-tree halting place' (Pö-dang). Next day continuing his march, he lunched at 'the big spring' (Chhu-mik chhen), and crossing the ridge at the junction of 'the three hills' (Ri sum), reached 'the Kalön's stockade or 'pong' as the Lepchas call it (Kalön-pong), &c., &c.

The Paháriyás and Bengalis are addicted to giving a personal name to their villages; this is perhaps inevitable where the area, as is usual in such cases, is thickly populated, and presents no striking natural features. The Paháriyás share with Europeans the tendency to transplant to their adopted home, names taken from their old country, although these possess no local appropriateness in their new application.

*On the date of the Bower Manuscript.—By A. F. RUDOLF HOERNLE.*

The Bower manuscript was exhibited to the Society at the two meetings in November, 1890 and April, 1891. I call it the "Bower MS.," in order that Lieutenant Bower, to whose enterprise the learned world owes the preservation of the manuscript, may receive the honour due to him. Some account of the locality and circumstances of its finding will be found in the Society's *Proceedings* for November, 1890; and a preliminary account of the manuscript and its contents was published by me in the *Proceedings* for April, 1891. Since then I have spent a long summer vacation in carefully examining the whole manuscript, and, with the exception of a few leaves, I have read and transcribed the whole. I have every reason to hope that the Bengal Government, with its usual liberality in such matters, will enable me to publish a complete edition of the manuscript which I am now preparing.

This paper had been written (in Darjiling, in May), when I received (in July), through the kindness of Professor Bühler in Vienna, an advance copy of his notice† of the specimen pages of the Bower MS.,

\* Vide detailed definitions at p. 60.

† To be published apparently in the *Vienna Oriental Journal*.

which were published in the November *Proceedings*. It was particularly gratifying to me to find that, reading the manuscript, he in Vienna and I in Calcutta, at about the same point of time, we independently arrived at essentially the same conclusions, both with regard to the age and the contents of the manuscript. Such a coincidence most distinctly makes for the truth of our conclusions.

The substance of the paper which I now publish on the age of the Bower MS., and which I promised in the April *Proceedings*, was originally intended by me to form a part of the introduction to my edition of the manuscript. But seeing the interest which the manuscript has already excited in Europe, I publish it now in anticipation, and hope similarly to publish portions of the manuscript, with translations, from time to time.

I may state here briefly the result of my detailed examination of the manuscript. It consists of not less than five distinct portions.

The first portion consists of 31 leaves. It contains the medical work of which I have published the commencement in the April *Proceedings*, and two pages of which are figured in the upper parts of the two plates accompanying the November and April *Proceedings*. I shall designate it by the letter A.

The second portion, to be called B, which immediately follows the first portion, consists of five leaves, and forms a sort of collection of proverbial sayings. A specimen of it is figured in the lower part (No. II) of the plate in the April *Proceedings*.

The third portion, C, consisting of four leaves, contains the story of how a charm against snake-bite was given by Buddha to Ananda while he was staying in Jetavana, the garden of Anáthapiṇḍa. A specimen of this portion is figured in the lower part of the plate in the November *Proceedings*.




The fourth portion, D, consists of six leaves. It is preserved in a rather unsatisfactory condition, and appears to contain a similar collection of proverbial sayings as the second portion, B.



The fifth portion, E, which also consists of five leaves, contains the commencement of another medical treatise. It appears to be—so far as I can judge at present—a fragment of a larger work.

Besides these five connected portions, there appear to be a few detached leaves, quite unconnected with one another and with those larger portions.



Of the fourth and fifth portions no specimens have been published, but the fifth is written in the same style as the first portion. The fourth portion is written in an exceedingly slovenly and hurried hand, much resembling that of the third portion, but written far more slovenly. It may possibly represent the handwriting of a fourth scribe; though, on

the whole, I am disposed to believe that there are really only three distinct styles of writing represented in the entire manuscript. The first is that of the first and fifth portions (A and E); they are so nearly alike, that I believe them to be of the same scribe. The second is that of the second portion (B), which is a fine, ornamental writing. It must be ascribed to a distinct scribe. The third is that of the third and fourth portions (C and D), which seem to me to differ more in the manner than in the character of writing, and may not improbably be due to the same scribe, though a different person from the scribes of AE and B.

I come now to the question of the age of the MS. Here the first points to be settled are the locality and class to which the characters of the MS. belong. Mr. Fleet has clearly shown, in his Volume III of the *Corpus Inscriptionum Indicarum* on the Gupta Inscriptions,\* that, irrespective of varieties, there existed, at the time of the Gupta period, two very distinct classes of the ancient Nāgarī alphabet, the North Indian and the South Indian (see Fleet, pp. 3, 4). The test letter for these two great classes is the character for *m*, which in the Southern alphabets retains its old form , resembling the figure 8, while in the Northern alphabets that old form has been displaced by a square cursive form . Tried by this test, it is at once seen that the alphabet of our MS. belongs to the Northern class. Throughout the MS. the square form  is used exclusively. It is particularly distinct in the portions C and D; in ABE the left hand curved line in drawn rather more straight.

The Northern class of alphabets, however, is again divided into two great sections, which, though their areas overlap to a certain extent, may be broadly, and for practical purposes sufficiently, distinguished as the Western and Eastern sections. The test letter in this case is the cerebral sibilant *sha*. In the North-Eastern alphabet its form is , while in the North-Western alphabet its form is .† Examples of the former alphabet we have on the Allahabad pillar inscription of Samudra Gupta, of about 400 A. D. (Fleet, pp. 1, 6), the Kuhaun pillar inscription of Skanda Gupta, of 460 A. D. (Fleet, p. 65), and others in Mr. Fleet's volume.‡ The same alphabet is shown to perfection in the

\* All subsequent references to "Fleet" refer to this work.

† At the same time the Indian N. E. alphabet has the form  for the dental *sa*, the two forms of *sha* and *sa* being very little distinct from one another. The Indian N. W. alphabet has  for *sa* which is also used by the Nepalese variety of the N. E. alphabet.

‡ The following Nos. in Mr. Fleet's volume belong to this class: Nos. 1, 6, 7, 8, 9, 11, 12, 13, 15, 64, 66, 68, 69; occasionally the Western form is used in conjuncts, such as *śha*, *śha*.

Nepalese inscriptions, Nos. 1 to 10 and No. 12, published in the *Indian Antiquary*, vol. IX, p. 163; also in the Nepalese inscriptions Nos. 1 and 2, in Mr. Bendall's *Journey in Nepal*, pp. 72, 74. On the other hand, the other Nepalese inscriptions in vol. IX of the *Indian Antiquary*, Nos. 11, 13, 14, 15, and in Mr. Bendall's *Journey*, Nos. 3 to 6, exhibit the North-Western alphabet. The latter alphabet is also to be seen in all the Nepalese MSS., described in Mr. Bendall's *Catalogue of Buddhist Sanskrit MSS.*, including the two oldest, Nos. 1049 and 1702.

Examples of the North-Western alphabet in Mr. Fleet's volume are the Mathurá stone inscription of Chandra Gupta, of about 400 A. D., the Indor plate of Skanda Gupta, of 565 A. D., and others.\* Also the Toramāna inscription in the *Epigraphia Indica*, Vol. I, p. 238, and the Nepalese inscriptions above mentioned.

In both the North-Eastern and North-Western sections there are divisions into varieties, some of which Mr. Fleet has noticed. However for my present purpose, there is no need to enter into any consideration of these. But the distinction of the two great sections is very marked, and can never be missed when once pointed out.

There is one point, worthy of notice, with regard to these two great Northern divisions. It is this, that in India proper the North-Eastern alphabet gradually came to be entirely displaced by the North-Western alphabet, in comparatively very early times. This displacement must have been in progress during the earlier part of the sixth century A. D., and must have been completed about 580 A. D. For in 588 A. D. we already find inscriptions in Bodhgayá (of Mahánáman, Fleet, p. 274) which show an exclusive North-Western character; and there is not a single inscription known (so far as I am aware) about and after 600 A. D. which shows the distinctive marks of the old North-Eastern alphabet. Outside of India proper, that is in Nepál, the North-Eastern alphabet maintained its ground for about three centuries longer; for the inscription, No. 4 in the *Indian Antiquary*, vol. IX, dated in 854 A. D., still shows the use of that alphabet. This survival is accounted for by the fact,\* that the North-Western alphabet made its way into Nepál, apparently, about a century later than into Eastern India proper. For the earliest known inscription, in that alphabet, is No. 11 in the *Indian Antiquary*, vol. IX, which is dated in 653 A. D. For the purpose of manuscript writing, as distinguished from documentary inscription, the North-Western alphabet probably made its way into Nepál very much earlier, as shown by Mr. Bendall's old MS. No. 1049, if (as I think it may well be) it is dated in 252 of the Gupta Era, that is, in 571 A. D.

\* The following Nos. belong to this class: Nos. 4, 10, 16, 19, 20, 22—37, 42, 43, 46—54, 58—61, 63, 65, 67, 70—72, 74, 76.

Now the Bower MS. is distinctly written throughout in the North-Western alphabet. This is an important point and must be kept in view throughout the following enquiry. The age of our MS. must be judged solely by the facts as disclosed by the circumstances of the North Western alphabet. No conclusion that can be drawn from circumstances connected with the South Indian or the North-Eastern alphabets may be applied to the determination of the age of our MS. For it stands to reason, that no scribe, who was habituated to write in the North Western alphabet, would in any writing of his habitually introduce any peculiarity of the South Indian or North Eastern alphabets, with which he was not familiar.







Having premised this much, I proceed to the consideration of the points that appear to me to afford the means of determining approximately the date of the Bower MS.

Among the existing varieties of the North-Western alphabet, there is one which has most nearly retained its ancient character. This is the so-called Śāradā alphabet, which is still current in Kāshmir and the adjacent Sub-Himalayan provinces, such as the Chambā and Kāngrā valleys. The most striking point of difference between the Śāradā alphabet and its more ancient parent, the original North-Western alphabet, is the sign for the letter *ya*. The Śāradā alphabet uses the modern cursive form य, while the original North-Western alphabet employed the more ancient tridential form य. This is the test letter by which any inscription or manuscript written in the Śāradā characters may be at once distinguished from any inscription or manuscript written in the more ancient North-Western alphabet. The latter I shall, for the sake of convenience, briefly distinguish as the Gupta alphabet. The oldest MS. in the Śāradā characters, of the existence of which we know, is the so-called Horiuzi MS., of which Professor Bühler has published an account and illustrative plates, in Volume I, Part III of the *Anecdota Oxoniensia*.\* According to him, "it is certain that this MS. cannot date later than the first half of the sixth century A. D." (*ibid.*, p. 64). It employs throughout the modern cursive form of *ya*. On the other hand, the Bower MS., though showing in the writing of parts A and E, in many respects, a very decided resemblance to the Śāradā characters, employs in the portions BCD exclusively, in AE almost exclusively, the older tridential form of the letter *ya*. It follows, therefore, that the Bower MS. is not written in the Śāradā alphabet, but in the more ancient

\* "Śāradā" is the name of a small group of alphabets, the varieties of which differ a little according to locality (Kāshmir, Chambā, etc.) or period or material of writing, etc.; but the essential unity of the group is well known, and it is usual to call it Śāradā.



*Gupta alphabet.* The general similarity of its letters to the Śāradā probably shows, that the locality of its writing was somewhere in the extreme North-West of India, but *its use of the ancient tridental form of YA shows that its date must be antecedent to the elaboration of the Śāradā form of the North-Western alphabet.* When this event took place, I shall now attempt to show.

The old form (though not quite the oldest which was ) of the letter *ya* was  or . It was made by two separate movements of the hand, one for drawing the left-hand perpendicular, the other for drawing the remaining portion of the letter. The next step was an attempt to draw the letter with one movement of the hand. This led to the contrivance of the form , by which the end of the left-hand crook or loop was brought forward to the point of junction of the perpendicular and horizontal portions of the letter. It was now possible to draw the letter with one stroke of the pen, beginning with the top of the left-hand perpendicular, downwards; then round the loop, from left to right, to the bottom of the perpendicular; than finishing with the right-hand crook or angle. This change was clearly due to the convenience of cursive writing. But the tendency of cursive writing to quickness and economy of effort very soon led to a further change, which produced the form , by severing the point of junction. This was the final form of the process; it is still essentially the modern cursive form. The intermediate form , as I shall presently show, only existed for a comparatively very short time, and is essentially a mere transitional form.

It is a well-accepted fact that cursive forms first make their appearance in manuscript writing, and may be, and generally are, in use in MS. writing some time before they are introduced in the inscribing of documents on stone, copper or other material. Such documents are of a conservative nature; they have a tendency to preserve old forms, after they have long disappeared from ordinary MS. writing. The common or exclusive use, in an ordinary MS., of a distinctly archaic form is, therefore, a safe means of determining its age.

The old form of the letter *ya* was once current in all the alphabets of India. In all of them it gradually became displaced by some cursive form. But this displacement did not take place in all of them at the same point of time. In the South Indian alphabet it survived, at least in inscriptions, down to the twelfth century A. D.\* The North-Eastern alphabet,

\* In the old Kanarese, where it much resembles the later Nepalese form with the ringlet attached to the left prong (see p. 85). See, e. g., the Eastern Chalukya inscription of 1134 A. D., in the *Ind. Ant.*, vol. XIV, p. 50, or the Kākatiya inscription of 1162 A. D., *ibid.*, XI, p. 9. It has now passed into the various modern cursive forms of the South-Indian alphabets.

as I have already remarked, was, in India proper, as early as the middle of the sixth century, superseded by the North-Western alphabet; but in Nepál it survived about three centuries longer, and there, with it, the old form of *ya* survived, at least in inscriptions, down to the middle of the ninth century A. D. It should be noted, however, that the old form of *ya*, in the shape in which it survived in Nepál, is somewhat different from the old form in its original shape, as it was once current in the North Indian alphabets. Its original shape is that of a sort of trident, of which the left-hand prong makes a curve or even a loop, thus *Y* or *Y*. In the Nepalese shape, the curve or loop, is replaced by a ringlet which is poised on the top of the left-hand prong, thus *YU*.\* The difference is marked, and the two shapes can be very easily distinguished from each other.

The North-Western alphabet is the first to discard the use of the old form of *ya*. From it, as I shall presently show, the old form disappeared, even in inscriptions, as early as the end of the sixth century A. D.; and from cursive writing in that alphabet, according to the well-known rule, above stated, it must have disappeared much earlier. There is an obvious conclusion, which is suggested by these facts; it is, that *the invention, so to speak, of the cursive form of YA took place in the North-West of India, somewhere within the area in which the North-Western alphabet was current.*

The first document from which the use of the old form has entirely disappeared is the long Bodhgayá inscription of Mahánáman of 588 A. D. (Fleet, p. 274). It uses exclusively the transitional form, with one or two exceptions in which the modern form itself is used.† In another short Bodhgayá inscription of Mahánáman, of about the same date (Fleet, p. 278), the modern form is used exclusively. *In fact, after 600 A. D., there is no inscription known, which shows any trace of the survival of the old form.* In all of them the cursive form of *ya* is fully established in exclusive use; thus in the Lakkha Mandal inscription of about 600 A. D. (*Epigr. Ind.*, vol. I, p. 10),‡ the Madhuban inscription of Harsha, of 631 A. D. (*ibid.*, p. 67), the Aphsāḍ and Sháhpur inscriptions of Adityasena, of about 672 A. D. (Fleet, pp. 200, 208), the Deo Baranark inscription of Jivita Gupta, of (about) 725 A. D. (Fleet, p. 213), the Sárnáth inscription of Prakaṣáditya of somewhere in the seventh century (Fleet, p. 284). To these may be added the evidence of those Nepalese inscrip-

\* See, e. g., the inscription No. 8, in the *Ind. Ant.*, vol. IX, p. 171.

† The transitional form is here used with a somewhat modified and more ornate shape.

‡ The intermediate forms occurs twice in this inscription, in *yena*, ll. 6 and 11, curiously enough, with the vowel *e*, on which see page 89.

tions, which are not written in the North-Eastern or proper Nepalese alphabet, but in the North-Western characters; thus the Gaidhará inscription of 688 A. D. (see Mr. Bendall's *Journey in Nepal*, p. 77), the Jaisí inscription of 751 A. D. (*ibid.*, p. 79), the inscription of Siva Deva, of 748 A. D., another of 750 A. D., and the inscription of Jaya-deva, of 758 A. D. (see *Indian Antiquary*, vol. IX, pp. 176-78). In all these inscriptions the modern cursive form is used exclusively.

Another piece of evidence, in the same direction, is the Tibetan tradition respecting the introduction of the Northern Indian alphabet into Tibet (see *Journal, Asiatic Society of Bengal*, vol. LVII, pp. 41 ff.). It is said that these characters were introduced into Tibet by the sage Sambhoṭa, who brought them from Magadha, where he had resided from A. D. 630-650. These characters are known in Tibet as the "Wartu" characters of Magadha; their forms, as traditionally preserved in Tibet, may be seen in Plate I of the *Journal* (*ibidem*); and it will be seen that among these the letter *ya* has the cursive form. This shows that at the time of Sambhoṭa's visit to Magadha, in the second quarter of the seventh century A. D., the cursive form of *ya* was in current use in North India.\*

*I am not aware of the existence of a single dated inscription in North India, written in the North-Western alphabet, which indubitably proves any use, still less the exclusive or almost exclusive use of the old form of YA, after 600 A. D.* It follows from this evidence that, since the old form of *ya* had entirely disappeared from inscriptions, from the end of the sixth century (say from about 580 A. D.), it must have disappeared from the cursive writing of ordinary manuscripts long before. Accordingly a manuscript, like the Bower MS., in which the old form is still used almost exclusively, must be placed long before the end of the sixth century, and much nearer the beginning of it.

This conclusion is fully supported by the evidence of all the ancient dated (or practically dated) MSS. that are, as yet, known to exist. The oldest is the Horiuzi MS. The date of its writing has been shown by Professor Bühler to be somewhere in the middle of the sixth century,

\* The "Wartu" characters exhibit in all test points the characteristics of the North-Western alphabet. This shows, what I have already observed (*supra*, p. 82), that the North-Eastern alphabet, which was once current in Magadha, was there in very early times displaced by the North-Western alphabet. It is said, however, that Sambhoṭa only "partly" adopted the "Wartu" characters for his Tibetan alphabet (*Journal, ibid.*, p. 41). This explains the fact that the "Wartu" or cursive form of *ya* does not appear in that alphabet. For the letter *ya* that sage appears to have drawn on the North-Eastern alphabet, which he must have known from Nepál, where (as I have shown) it maintained its ground from two to three centuries longer than in Magadha.

that is, between 520 and 577 A. D. (see *Anec. Oxon.*, p. 63 ff.). It exhibits throughout the exclusive use of the cursive form of *ya*, thus showing that this cursive form was fully established for MS. writing in the middle of the sixth century A. D. The next oldest MSS. are two, described as Nos. 1049 and 1702 by Mr. Bendall in his *Catalogue of Buddhist MSS. in the Cambridge Library*, p. XXXIX. One of them is dated Samvat 252, which Mr. Bendall takes to be in terms of the Harsha era and to be equal to 857 A. D. For my part, I can see no valid objection, on palæographic grounds, to understanding the date in terms of the Gupta era, and as equal to 571 A. D. I do not notice any such material difference between the writing of the Horiuzi MS. and the two Cambridge MSS., as to account for a supposed interval of three centuries. Any how, both Cambridge MSS. exhibit the exclusive use of the cursive form of *ya*.

The conclusion appears to me inevitable, that any MS. which shows, as the Bower MS. does, the exclusive use of the old form, or which shows an uniform absence of the use of the cursive form, cannot possibly be placed later than 550 A. D., and in all probability is very much older. The only question is, whether there are any indications in the Bower MS. that render it possible to fix its date somewhat more definitely.

Here the following facts are to be observed. The first appearance of the modern cursive form of *ya* in any inscription is met with in the Bijagaḍh inscription of Viṣṇu Vardhana, of 371 A. D. (Fleet, p. 252), in *śreyo*, line 4 (if the plate can be trusted); and it is to be noted that it is used in junction with the vowel *o*. The old form, however, is more usual, as in *nāmadheyena*, l. 3, and *abhivṛiddhaye*, l. 4, in both cases with the vowel *e*. The first appearance of the transitional cursive form is met with about a century later (see below), but there can be no doubt that, though in the existing inscriptions, the first appearance of the modern form happens to be earlier, that form, as compared with the transitional form of the letter, is of later development.\* Probably there was no great interval between the development of the two forms. In any case, the invention (so to speak) of the transitional form and, with it, the first beginnings of the modern form of *ya*, may, thus far, be placed at about 350 A. D.

The actual first appearance of the transitional form occurs in the Indor copperplate inscription of Skanda Gupta, of 465 A. D. (Fleet, p. 68), in the words *abhivṛiddhaye*, l. 4, and *upayoḥyam*, l. 7, in both cases with the vowels *e* and *o*. Side by side, the old form occurs in *yogam*, l. 9, *yo* l. 11, *abhivṛiddhaye*, l. 8. Other instances occur in the Karitalai inscription of Jayanātha, of 493 A. D. (Fleet, p. 117), in

\* A similar case, with regard to the development of the letter *m*, is noted by Mr. Fleet in his volume on the Gupta inscriptions, p. 3, footnote.

*abhivṛiddhaye*, l. 7, and *chhreyo*, l. 15, here also with the vowels *e* and *o*; and side by side with the old form in *ye*, l. 10, *lopayet*, l. 12, *práyena*, l. 16, *yo*, l. 20. Another instance occurs in the Khoh inscription of Jayanátha, of 496 A. D. (Fleet, p. 121), in the word *abhivṛiddhaye*, l. 8, again with the vowel *e*, and side by side with the older form in *pratyáyanayam*, l. 11, and *práyena*, l. 17. A very clear instance is in the Tusam inscription, of about 500 A. D. (Fleet, p. 269), in *yogá-cháryya*, l. 3, again with the vowel *o*, and side by side with the old form in *upayojyam*, l. 6.\* Another clear instance occurs in the Jaunpur inscription of Íśvaravarman, of about 520 A. D. (Fleet, p. 228), in *anuváde*, l. 2, again with the vowel *e*. So again in the Mandasor inscription of Yaśodharman, of about 530 A. D. (Fleet, p. 149), in *yo*, l. 4, again with the vowel *o*, and side by side with the old form in *pádāyor*, l. 5. Similarly in the Mandasor inscription of Yaśodharman as Vishṇu-vardhana, of 533 A. D. (Fleet, p. 150), in *yena*, l. 8, again with the vowel *e*, and side by side with the old form in *bhúrayo*, l. 8,† *yena*, l. 8, 13, *yo*, l. 17, 18. Likewise in the Khoh inscription of Śarvanátha, of 533 A. D. (Fleet, p. 135), in *nyáyena*, l. 13, *ye*, l. 16, and *pratyáyotpannaka*, l. 9, again with the vowels *e* and *o*, and side by side with the old form in *lopayet*, l. 18, *grámayor*, l. 7, *yo*, l. 25, *ye*, l. 27, etc. These are all the instances of the occurrence of the transitional form that I have been able to discover among the 43 (Gupta) inscriptions in the North-Western alphabet, published by Mr. Fleet.

Contemporary with them are the following instances of the use of the modern cursive form. In the Maghawan inscription of Hastin, of 510 A. D. (Fleet, p. 106), it occurs in the words *chhreyo*, l. 14, *yo*, l. 16, *paniyeshu*, l. 17, *ye*, l. 18, again with the vowels *e* and *o*, and side by side with the old form in the words *anvayopabhogyas*, l. 10, *yo*, l. 11, *ahayo*, l. 18.‡ The transitional form also occurs in the word *abhivṛiddhaye*, l. 7.

Now as to the conclusions that follow from the above statistics, note, in the first place, the extreme rarity of the transitional and full cursive forms, as well as the peculiar circumstances under which alone they occur. And here mark the following four points.

(1) *They occur only in a small proportion of inscriptions.* Of course, the only inscriptions with which we are here concerned are those that use more or less exclusively the old form. Those that already use

\* This instance was also noticed by Mr. Fleet (p. 270, footnote 4). It is the identical form that occurs in the Bower MS.

† This is a very good instance for comparison, because in *bhúrayo yena* the two forms stand in immediate juxtaposition.

‡ In these cases the peculiarity of the form is also noted by Mr. Fleet, p. 106.

the transitional or modern cursive forms exclusively are outside the question; so are, of course, all those that are not written in some variety or other of the North-Western alphabet. Now there are 34 inscriptions of the former description in Mr. Fleet's Volume III of the *Corpus Inscriptionum Indicarum*. To these may be added a few others, such as the Toramāna inscription in the *Epigraphia Indica*, vol. I, p. 238, and the Kumāra Gupta seal in the *Journal, Asiatic Society of Bengal*, vol. LVIII, p. 88. Among these there are only ten inscriptions, a little more than *one-fourth*, that exhibit the occasional use of the transitional and modern cursive forms at all. The rest use exclusively the old form.

(2) *The transitional and full cursive forms occur, in that one-fourth of inscriptions, exclusively in connection with the vowels E or O.\** With all other vowels, i. e., in every other case, the old form is used.

(3) *Even in connection with the vowels E and O, the transitional and modern cursive forms are not obligatory, but optional.* In fact, even with those vowels, the old form is used more commonly than the transitional and modern cursive forms. On the whole the former is used twice as often as the latter.

(4) *Of the two cursive forms, the transitional and the modern, the former is used much more frequently than the latter (viz., transitional: modern = 13:4).*

In the second place, note that the period during which the sporadic use of the transitional and modern cursive forms occurs, is a comparatively well defined and short one. Its termini, so far as the evidence of the available inscriptions goes, are from 371 A. D. to 533 A. D., or in round numbers from 370 to 540 A. D., i. e., 170 years. Or, if we omit the very early case of the Bijagadh inscription, of 371 A. D., as perhaps of a suspicious character, because it stands by itself, separated by an interval of about 100 years from all others, *the transition period extends from about 470 to 540 A. D., that is, 70 years.* Antecedently to this period, we find the old form of *ya* in undisputed possession of the field, and subsequent to it, the cursive form of *ya* is in equally undisputed possession.

Now it appears to me, that from these facts there is but one conclusion, to which one is irresistibly driven. It is this, that there is here disclosed to us evidence of the actual point in time, when the invention, so to speak, of the cursive form of *ya* was made, or, to speak more precisely, the application of it to the non-conjunct *ya*. For to suit the case of the conjunct or under-written *ya*, the cursive form had been long before

\* Probably it would also be used with the vowels *ai* and *au*; though no instance happens to occur in the existing inscriptions.

invented and exclusively employed. But to the non-conjunct *ya*, it only began to be applied about 470 A. D. At first it was only applied tentatively and hesitatingly in those cases in which the non-conjunct *ya* carried the vowels *e* or *o* (or *ai* or *au*). But the convenience of the cursive form soon carried everything before it, and displaced the old form entirely about 540 A. D.\* In all probably *this process commenced, in the case of manuscript writing, earlier than in that of documentary inscription, perhaps already about 400 A. D., and terminated proportionately earlier, perhaps about 500 A. D.* On the other hand, in documentary inscription the process began later and ended later. Here the use of the old form may have lingered on to about 600 A. D.; but from that date, as already shown from the evidence of existing dated inscriptions, the use of the cursive form of *ya* enjoyed an undisputed possession of the field.

Accordingly for practical purposes, the rule may be laid down, that *any inscription in the North-Western Indian alphabet which shows the more or less exclusive use of the old form of YA must date from before 600 A. D., while any inscription showing an exclusive use of the cursive form of YA must date from after 600 A. D.*

With regard to manuscripts the same rule must hold good, with this modification, that the termini must be put back by about 50 (or it may be 100) years; that is, a MS. showing the exclusive use of the cursive form of *YA* must date from after 550 or perhaps 500 A. D., while a MS. showing the more or less exclusive use of the old form of *YA* must date from before 550 or 500 A. D., and a MS. showing the exclusive use of the old form of *YA* must date from before 450 A. D.

That this rule, as deduced from the above collected facts, is correct is proved by the Horiuzi MS. This MS. uses the cursive form of *ya* exclusively, and, as shown by Professor Bühler, it certainly dates from some time between 520 and 577 A. D.

This rule further proves that the elaboration of the so-called Śāradā alphabet may be placed about 500 A. D. For it possesses the cursive form of *ya*. Hence it follows that *any manuscript and a fortiori any inscription, written in the Śāradā characters must certainly be later than 500 A. D.;* though as the Śāradā characters, with slight modifications, are used up to the present day in Kāśmīr and the adjacent regions, a mere consideration of the form of the cursive *ya* is insufficient to fix with any approximation the date of such a manuscript or inscription in any particular year after that epoch.

Now let us see the bearing of the results of the above enquiry on the question of the age of the Bower MS.

(1) It is to be noticed that *the old form of YA is used almost ex-*

clusively throughout the MS. Indeed, in the second, third and fourth portions it is used exclusively, and it is only in the first and fifth portions, that the transitional form occasionally occurs.

(2) *This transitional form is never used, except when carrying the vowels E or AI or O or AU.*

(3) *Even with those vowels, the use of the transitional form is optional; though on the whole, it is more usual than that of the old form.*

(4) *Of the two forms of the cursive YA, the transitional and the modern, the former is used almost exclusively; the modern cursive form occurring only in a few isolated cases.*

The following examples are all taken from the two published plates; and I have only to remark, that the pages, figured on the two plates, are very fair specimens of the whole manuscript.

The transitional cursive form is to be seen on Plate I, No. I,\* in *yoga*, l. 1, *yoga*, l. 2 twice, *yogánám*, l. 3, *trayodaśam*, l. 5, *kalpayet*, l. 9; again on Plate III, upper page, in *jivaníyo*, l. 2, *payo*, l. 4, *jivaníyaischa*, l. 4, *lepayet*, l. 4, *vimiśrayet*, l. 6, *prayojayet*, l. 6, *avagáhayet*, l. 6, *yo...*, l. 6, *lehayet*, l. 8, *prayojayet*, l. 11. Note that it is always used with the vowels *e* or *ai* or *o*.

There is only one instance of the modern cursive form; it occurs in the akshara *yet* of *prayojayet* in Plate III, upper page, in line 11. Here we have the transitional and the modern cursive forms side by side in one word, the former form being used in the akshara *yo*, the latter in the akshara *yet*. A similar instructive example of the use, side by side, of the old and the transitional forms, we have *ibidem* in *prayojayet*, in line 6, where the old form is seen in the akshara *yet*, while the transitional form occurs in the akshara *yo*.

Of the old form there are the following instances. On Plate I, No. I, we have it in *chúrṇṇayet*, l. 10, and on Plate III, upper page, in *upakalpayet*, l. 2, \* \* *yet*, l. 3, *prayojayet*, l. 6, *lehayet*, l. 8, *páyayet*, l. 9. Note here again, that all these instances are with the vowel *e*. Of the old form with the vowel *o* there is no instance in the figured pages; but I have noticed a few cases in other parts of the manuscript. Of course, I exclude here, as being beside the precise point in question, all instances of the use of the old form in combination with any other vowel, only remarking, that it is used uniformly with all other vowels.

To sum up, the examination of the two specimen pages shows: *ad* Nos. 1 and 2, that the old form is used exclusively, except with the vowels *e*, *ai*, *o* and *au*†; *ad* No. 3, that out of 23 instances, in which the

\* Plate I is in the April *Proceedings* 1891, and Plate III in the November *Proceedings*, 1890.

† Of *au* there is no instance in the figured pages, but I have met with a few in other pages of the manuscript.



letter *y* is combined with the vowels *e* or *ai* or *o*, the cursive (transitional and modern) form is used in 17, while the old form is used in 6; that is, the former is used about three times as often as the latter; *ad* No. 4, that out of 17 instances of the use of the transitional and modern cursive forms, the former is used 16 times, while the latter occurs only once; *i. e.*, that the transitional form is used almost exclusively.

Now comparing the case of the Bower MS. with that of the Gupta inscriptions, the result is this, that the two cases, while fully agreeing in the main points, differ only in one particular, namely, that the cursive (transitional or modern) form is used in the manuscript rather more frequently than the old form (*viz.*, cursive: old = 3 : 1), while in the inscriptions the old form is used rather more frequently than the cursive form (*viz.*, cursive: old = 1 : 2). This, however, is nothing more than may be expected, if we consider that on the one side we have a case of ordinary manuscript writing, on the other one of documentary inscription, and remember that (as Professor Bühler says, in *Epigraphia Indica*, p. 68) "everywhere in India the epigraphic alphabets are in many details retrograde and lag behind the literary ones."

One thing, however, is clearly brought out by the evidence above set out, that the writing of the Bower MS. must be placed within that period, which, as we have seen, is marked out by that evidence as the period of transition from the use of the old rigid form of *ya* to the use of the (still existing) cursive form; that is, for manuscript writing, *within the period from about 400 to 500 A. D., or the fifth century.*

It is true that in the second, third and fourth portions of the Bower MS., the old form is used exclusively. There is no trace whatsoever of either the transitional or the modern cursive forms. Judging by this circumstance only, we should have to place the MS. still earlier, somewhere before the fifth century A. D. But this would certainly seem to be wrong with regard to the second portion. For the fact, that this portion was written after the first, seems to be clearly proved by the circumstance that it commences on the reverse of a leaf, on the obverse of which we have the ending of the first portion. Properly considered, however, that circumstance only tends to confirm the conclusion that the main portion (ABE) of the Bower MS. was written during the transitional period. For it is only natural to suppose that during that period, some scribes had already more or less adopted the new fashion of cursive writing, while others, more conservative, adhered to the older fashion. On the whole, therefore, considering that the portions A and E of the MS. appear to manifest a decided tendency to a free use of the transitional form, it will probably be safer to place the date of the main portion of the MS. nearer to the end than the beginning of the transi-

tion period, that is to say, in the second half of the fifth century (say, about 475 A. D.). The portions C and D, however, may be referred to the commencement of that period (say 425 A. D. or even earlier).

This result will probably be startling to most of my readers. There exists,—and I admit, hitherto not without reason—a pretty general tendency to discredit any claim to great age on the part of any Indian manuscript. I used to incline to the same opinion, and the present result was an unexpected one to myself. But I do not see, how the force of the evidence can be gainsaid.

Let us see what the objections are. In the first place it is said, that the material of the MS.—birch bark—is of a nature too weak and flimsy, to permit us to believe that it could endure for such a length of time. This argument has been already well answered by Mr. Bendall in his *Catalogue of Buddhist Sanskrit MSS.*, p. XVII ff., and by Professor Bühler in the *Anecdota Oxoniensia*, vol. I, part III, p. 63 ff. No *a-priori* rule will apply; all depends on the circumstances under which a MS. may have been preserved; and the argument, from the nature of the material, will not stand for one moment against positive arguments from epigraphic history. According to Lieut. Bower's account, the MS. "had been dug out of the foot of one of the curious old erections just outside a subterranean city near Kuchar." These erections are described as being generally about 50 or 60 feet high, in shape like a huge cottage loaf; built solid of sun-dried bricks with layers of beams now crumbling away." I suppose it cannot be doubted that these erections are Buddhist stūpas. Such stūpas often contain a chamber enclosing relics and other objects; these chambers are generally near the level of the ground or "at the foot" (as it is said) of the erection, and they are often dug into by persons who search for hidden treasures. In this way the MS. was probably dug out, perhaps not long before it was made over to Lieut. Bower. In such a, practically air-tight, chamber there is no reason why a birch bark MS. should not endure for any length of time.



Another objection is that the characters used in a MS. are no guide to its age. It is said that "characters of the Gupta type have been used in very late times, and indeed are in use to the present day all along the region from which the Bower MS. comes." The characters which are here meant, are those used in the Káshmir, Chambá and Kángará valleys. They are those which are commonly known by the name "Sáradá characters. These, as already remarked, are a variety of the North-Western alphabet, and are that variety which has, more than any other, preserved the shapes of its ancient parent, the North-Western Gupta alphabet. Now it is not quite correct to say, that

the Śāradā alphabet has not changed; it is quite possible to distinguish the modern form of the Śāradā from its more ancient form. But what is really important is this, that *the Śāradā alphabet, so far as we have any dated evidence, never possessed, at any period of its existence, the old (Gupta) form of the consonant YA. It always possessed exclusively the modern cursive form of that letter.* I maintain, that there exists not a single dated MS. or inscription, written in any variety of the Śāradā alphabet, which does not show the exclusive use of the cursive form. This being so, it follows that any conclusions, drawn from facts connected with the Śāradā alphabet, have no application to a MS., which shows the almost exclusive use of the old (Gupta) form of *ya*, and which, therefore, is *not written* in the Śāradā characters. Now, what conclusions can be drawn from the facts connected with the Śāradā alphabet? Its exclusive use of the cursive *ya* shows that its elaboration is to be dated on this side of 500 A. D. But as it has but little changed the shape of its letters since the date of its inception, it follows, that any undated MS. or inscription written in the Śāradā alphabet *must* be placed after 500 A. D., but *may* be placed almost at any time *after that epoch*. That is really all that can be intended by the principle that the Śāradā characters are no guide as to age. More the principle will not bear, and it clearly is not applicable to a MS. which is not written in the Śāradā characters, but in a form of alphabet more archaic and very possibly the parent of the Śāradā. With the proviso, now explained, I fully agree with Professor Kielhorn's remark, made with reference to a Chambā Grant (in the *Indian Antiquary*, vol. XVII, p. 7) that "it would be impossible to determine the age, even approximately, from its characters," these characters being, as Professor Kielhorn explains, the well-known Śāradā. Judging from these characters, all that one could say would be that the grant may date from any time after 500 A. D., which, of course, would be a futile proposition.


The main argument for the age of the Bower MS. is the preservation in it of the old form of *ya*. No objection can be raised on the ground that the old form was preserved much longer in the South-Indian and the North-Eastern Indian (Nepalese) alphabets. As these alphabets differ from the North-Western Indian, which is used in our MS., any conclusions, drawn from the circumstances of those alphabets, have no applicability to our MS. It stands to reason that no scribe, used to his own North-Western Indian alphabet, would, in writing a MS., think of introducing the old form of a letter, which did not exist any more in his own alphabet, from another alphabet, unfamiliar to him, in which it did still exist.

P. S.—Since writing most of the above remarks I have, as already stated, read and transcribed nearly the whole of the manuscript. I have carefully noted every occurrence of the aksharas *ye*, *yo*, *yai*, and *yau*.

In the portions BCD I have found the cursive form (either transitional or modern) used *not once*. \* The aksharas *yai* and *yau* never occur; the akshara *ye* occurs 19 times (B 4, C 13, D 2), always with the old form of *ya*. The akshara *yo* occurs 9 times (B 7, D 2), again always with the old form.

In the portions A and E, the case stands thus: there are altogether 333 cases of the occurrence of those aksharas, *viz.*, 202 of *ye*, 125 of *yo*, 4 of *yai* and 2 of *yau*. In every case of *yai* and *yau* the transitional form  is used. With *ye* and *yo* the transitional form is used 227 times, and the modern form , 16 times. The transitional form occurs 117 times with *ye*, 110 times with *yo*, 4 times with *yai*, and twice with *yau*. The modern form occurs 12 times with *ye*, and 4 times with *yo*. Altogether the cursive form occurs 249 times. The old form occurs 73 times with *ye* and 11 times with *yo*. The following table exhibits this:

Aksharas :						Totals.
Old ...	...	<i>ye</i> 73	<i>yo</i> 11	<i>yai</i> 0	<i>yau</i> 0	84
Transitional ...	...	„ 117	„ 10	„ 4	„ 2	233 } 249
Modern ...	...	„ 12	„ 4	„ 0	„ 0	16 }
Totals	...	<i>ye</i> 202	<i>yo</i> 125	<i>yai</i> 4	<i>yau</i> 2	333

Now with regard to point No. 3 (see p. 89), there being 233 cursive forms to 84 old ones among a total of 333 cases, the proportion of cursive to old forms is as 3 to 1. With regard to the point No. 4, there being 233 transitional to 16 modern forms among a total of 249 cases, the proportion of transitional to modern forms is as (about) 15 to 1. In both cases, it will be seen, the evidence of the entire manuscript most accurately bears out the evidence of the specimen pages (see p. 91) and thus confirms my conclusions based on the latter. I may add with regard to the points Nos. 1 and 2, that in the portions A and E, the cursive (transitional or modern) form never occurs in any other akshara but those four: *ye*, *yo*, *yai*, *yau*. With the aksharas *ya*, *yá*, *yí*, *yí*, *yu*, *yú*, in every case, without any exception, the old form  is used. The occurrence of these six aksharas, especially of *ya* and *yá* is very frequent, and this fact all the more accentuates the striking circumstance that the cursive form is only employed with the vowels *e*, *o*, *ai*, and *au*. There must have been some reason for this peculiarity,—perhaps one of mere

convenience of writing, though I cannot suggest any satisfactory one. I should note, that the vowels *e*, *o*, *ai*, and *au* are drawn, both with the old and the cursive forms, in every possible variety: entirely side-marked, half side and half top-marked, and entirely top-marked. The cause of the peculiarity, therefore, cannot well have had any connection with the form of the vowels.

I would suggest that similar statistical enquiries should be made with reference to some other leading letters; e. g., *m*, *sh*, the sub-scribed *y*, the super-scribed *r*; also with regard to the numeral symbols. I have little doubt but that from such statistics may result some further useful land-marks for the determination of dates of writing. I hope to pursue the enquiry myself, so far as leisure from official duties will permit me.



# JOURNAL

OF THE

## ASIATIC SOCIETY OF BENGAL.



Part I.—HISTORY LITERATURE, &c.

No. III.—1891.

*Three Documents relating to the History of Ladakh : Tibetan Text, Translation and Notes.—By the late DR. KARL MARX, Moravian Missionary at Leh, Ladakh.\**

### INTRODUCTION.

The late lamented Emil von Schlagintweit, Ph. D., etc., in 1866 in the 'Abhandlungen der k. bayer. Akademie der Wissenschaften, I. Cl., X. Bd., III. Abth.,' under the title of 'Die Könige von Tibet,' published for the first time the text and translation, with notes and commentaries, etc. of the so-called 'Ladakh-Gralrabs.' This little book contained, after an introductory chapter, firstly, the genealogy of the Sákya; secondly, a brief history of the kings of Tibet (Yar-lung), and thirdly, a history of the kings of Ladakh. Now for the present it is not my intention to examine at all the first and second of these three divisions, but my remarks refer solely to the third and last, viz., the history of the kings of Ladakh, commencing at page 23a of the Tibetan text, and at pp. 62, 854 of the translation.

The Tibetan text was obtained for his brother Emil by Hermann von Schlagintweit-Sakünlünski, when on a visit to Leh, in 1856. It was a copy specially prepared for him, executed by three Lamas, but not until valuable presents had been given to the Rájá. It apparently

\* [The author of this paper died, before he could revise the proofs. It is now printed, as received from him. The press-corrections of the Tibetan portion have been kindly made by Bábu S. Ch. Dás, C. I. E. Ed.]

was written in U-chan characters; consequently in all those cases, when certain U-med letters are apt to be confounded, it may be taken for granted that, as compared with U-med MSS., preference must be given to Schlagintweit's edition, as being founded on an U-chan MS. On the other hand, any MS., specially prepared by a native of Ladakh for a foreigner, is apt to be less reliable than others of independent origin, for the reason,—which would especially be true regarding historical documents—that the copyist will have a tendency to slightly alter the text, in the interest of his master, religion or country, suppressing such facts as may seem derogatory to their fame, and substituting for phrases liable to be misunderstood others of a less equivocal character. As to Schlagintweit's edition it must be admitted, that the Lamas, who wrote the copy for his brother, did not give way to any such tendency until they reached the 6th line of folio 30a: be it that they wished to suppress certain facts contained in the sequel, or that they were of opinion, that the 'merit' of the presents extended no further: certain it is, that beyond this point, the text is merely a meaningless jumble of words, culled at random from the original and put together in such a way, that only a careful examination of the text by one who knew the language could reveal the fraud. These two and a half pages, therefore, which are supposed to embrace the history of about two centuries, are really not fit for translation, and the attempt can only conduce to results totally misleading. All the other parts of the MS. seems to have been done fairly well. There are mistakes in spelling, and here and there an omission or an addition of a word or phrase that did not belong to the original, but, on the whole, the MS. seems to have been better than many one sees here. The pages of this Journal, however, are, I fear, not the fit place to enumerate and discuss in detail all the various errors in writing that occur in the MS. The new Tibetan text, herewith published, will, to any one interested, clearly show where and how, in my opinion, Schlagintweit's text ought to be corrected; and to explain the reason why I dissent from his opinion, would, in a MS. of comparatively so little classical value as the 'Ladakh Gyalrabs', be sheer waste of time.

Schlagintweit's translation I would much prefer to pass over in silence, but as, for a new translation, there would be no *raison d'être* whatever, if his translation were at all adequate, I am compelled to state my opinion regarding it. It is as follows:

Considering that, in the first place, his Tibetan text left much to be desired;—that, secondly, in 1866 the Standard-Repository of the language of western Tibet, *viz.*, the Dictionary of Aug. Heinrich Jäschke, had not yet been published, and that therefore the meaning of many

words and idiomatic expressions with which we now are familiar were still undetermined;—that, thirdly, Schlagintweit was not in a position, by constant intercourse with natives of Ladakh, to test for himself the accuracy of the conclusions he arrived at;—that, fourthly, he, being at a distance, could not possibly have that knowledge of the country and people, which a sojourn in the country itself only confers;—and, finally, that to him even no map of western Tibet, and of Ladakh probably none more full than Montgomerie's route map of 1864, was available:—considering all these drawbacks, his translation, no doubt, was all that at that time could be accomplished. The amount of acumen and learning he expended upon it was so great, that the result certainly ought to have been of the first order.

Still, in the light of the present day, and with materials at hand that, no doubt, would have excited Schlagintweit's envy, it must be said that his translation can no longer be left unchallenged. Not only does he himself admit that there remain a considerable number of obscure passages, which he was unable to solve and which admit of a solution now;—but also, where he is confident to have divined the right meaning, his translation either remains so mysterious, as to be little more intelligible than the original Tibetan, or it is, from some misunderstanding or other, erroneous. Throughout the whole 'History of the Kings of Ladakh' there are, indeed, very few sentences, that at all give a correct idea of the meaning intended; most of it is either in part or totally wrong. I may say, that had his translation lent itself to being corrected and translated into English, I probably would have used it. But this was not the case. I had to discard it entirely and build entirely afresh on new ground.

In proof of this assertion I probably again ought to discuss in full, where and in what respects my translation differs from his, and show cause why I consider mine an improvement upon his. This, however, could again only be done, if I had an unlimited space at my disposal. Hence, as to the 'where' and 'how' we differ, I must again refer any one interested to the pages of the two translations themselves. He will, probably, find it difficult to reconcile the two, and possibly not understand that the original text, after all, should be almost identical. And also, as to the 'why' and 'wherefore,' I find myself under a necessity to abstain from any discussion, because if once gone into, it would be necessary to rewrite almost the whole of his and my own translation, and to analyze nearly every sentence. All I can do, therefore, is to submit my translation, without any special defence, to the judgment of Tibetan scholars and abide their verdict. I trust, however, that they will find it not so very difficult to discover, why I had definitely to set aside Schlagintweit's translation and attempted a new one.



And even those, who do not know Tibetan and hence are not in a position to determine every point of difference for themselves, will readily discover that, after all, the subject has gained a little in lucidity, and that the history of Ladakh, as far as it is contained within these pages, is no longer a chain of insoluble mysteries, but a coherent and intelligent, though simple and brief account of the past. This criterion is available to any one and is, probably, the best in any case.

The fresh material at my disposal consists of three different manuscripts. All of them are written in the U-med character.

A-MS. is a small book in 16mo., bound in leather and well kept. It contains, on 109 leaves, 1st, a cosmogony and cosmology in outline; 2nd, the genealogy of the Sákya; 3rd, a history of the kings of Tibet (Yar-lung); 4th, a history of the kings of Ladakh down to king Senge-nam-gyal (XXII). Throughout, it is most neatly written with comparatively few mistakes. As it was not originally written for an outsider, but for the private use of its owner, its text may safely be supposed not to have been altered on purpose. The history of the kings of Ladakh down to Senge-nam-gyal fills 20 leaves. It forms the basis of the Tibetan text, now published.

B-MS. are four loose leaves in folio, very old looking, very much worn at the edges and corners, and torn in some places. It commences with the history of the second (Nam-gyal) dynasty of Ladakh kings (compare translation, p. 123), and gives a comparatively full account of the history of Ladakh down to the Dogra invasion. This MS. is very badly written, so much so, that even Ladakhis find it difficult to read; still in point of excellence it ranks next to A, and the information it contains regarding the decline of the Ladakh empire (since De-ldan-nam-gyal, XXIII) is especially valuable. In order to avoid trespassing too much upon valuable space, I amalgamated the preceding and overlapping portions of B with the corresponding portion of A; that is to say, the portion of B containing the history of the Ladakh kings from Dags-pa-bum to Senge-nam-gyal inclusive, which coincides almost exactly with the corresponding portion of A, I do not purpose publishing separately, but it is embodied in A-MS., though any new matter contained in it is conscientiously preserved and specially marked there. My next publication will, therefore, have to commence with the successor of Senge-nam-gyal, that is, De-ldan-nam-gyal. It will have for its basis the rest of B-MS. with such additions as may be derived from C-MS.

C-MS. consists of two parts. The first part was specially prepared by command of the Wazir of Ladakh. Consequently all the vices, inherent in such MSS. as hinted at above, are manifest in it. It consists of 23 folio leaves. It is very carelessly written, and the text is very

incomplete. It is much inferior to either A or B. It is obvious in several places that alterations were introduced on purpose, and the principle underlying this practice can easily be discovered: it is, to avoid, in the first place, the miraculous, secondly, anything that may be offensive to the Dogra reader, and thirdly, all that may throw an unfavourable light on the Royal family. Still, there are a few passages preserved in it that are new; and they will be found introduced in their proper places and specially marked in A and B. This MS. covers the entire history of the kings of Tibet (Yar-lung) and of Ladakh to close upon the Dogra invasion. It also contains an interlinear translation into Urdú, but written in Tibetan (U-med) characters.

The second part of C-MS., was prepared for me at my special request by the writer of the first part, who is the head of one of the ancient families that presided over important functions under the old régime. As I am not an official personage, I think, I need not apprehend that he withheld the truth from me. In this portion he almost exclusively relates the events of the Dogra wars and the fall of the Ladakh empire. As his own father was mixed up to some extent with these painful affairs, it is to him a kind of family history as well. The very fact that he tells it at all and without any embellishing touches, goes far to prove his veracity in this case; and as the whole narrative does not contain one word derogatory to the conquerors, but a long tale of ignominy and shame to the losing, *i. e.*, his own, side, I think the character of the writer is fully established thereby. I, therefore, purpose giving this part of the MS. separately under the title of C-MS. It consists of about 6 folio leaves. Its language is the modern Ladakh book-language, and this fact alone should render it particularly interesting to students of the Tibetan language.

It will appear from these remarks, that all the three manuscripts were arranged by me so as to form one consecutive whole, containing as full an account of the history of Ladakh, as, for the present, it is possible to give.

As none of these documents, however, from a literary point of view, is really of classical value, I did not hesitate to introduce such corrections in the spelling of words, as were necessary to render them as readable as possible. The spelling uniformly adopted is that of Jáschke's Dictionary. Only in C-MS. I shall preserve the original orthography, wherever it is accounted for by Ladakh usage. \*

As to my own translation it is superfluous to say, that I attempted to give as true and faithful a rendering of the original in English as I could; and I hope and trust, that mistakes are few and far between. On the other hand, I may say, that it has been my aim throughout to

present it in such a form as will make it acceptable to English readers. If, after all, the wording seems clumsy and of little fluency,—I can only say that I ‘tried my best.’ As the English language is a foreign idiom to me, I think, that in this respect I am entitled to a certain amount of forbearance. Somehow, it seems to me, that to combine, in a translation, faithfulness to a Tibetan original with fluency in English is particularly difficult.

Apart from my own observations and special studies, I had to rely greatly upon the assistance of natives of Ladakh. Information derived from this source has, however, in every case been carefully sifted and compared with statements by other persons. As to works by European authors, Jäschke’s Dictionary was found invaluable. Koeppen’s ‘Religion des Buddha’ and ‘Lamaistische Hierarchie’ was a great help in many places. Sir Monier Williams’ ‘Buddhism’ (1890) sometimes proved useful. E. von Schlagintweit’s ‘Buddhism in Tibet (1863) is, I fear, not more reliable than his ‘Könige von Tibet’ (1866). Cunningham’s ‘Ladakh,’ I regret to say, was not accessible here, nor was Wassiljew’s ‘Buddhismus.’ Drew’s ‘Northern Barrier of India’ and his map are referred to on several occasions. Other maps used were the map of the Government Survey for Ladakh etc., and one sheet (SE) of the ‘Map of Turkestan’ (in four sheets, 1882). No maps relating to Central Tibet were available here.

In romanizing Tibetan names, I adopted, for the sake of its simplicity, Jäschke’s system as set forth in his useful ‘Tibetan and English Dictionary’ (Kyelang, 1866), with one or two exceptions, *viz.*, *h* as indicating an aspirate, I replaced by an apostrophe, (*e. g.*, for *chh*, *ths*, etc., I wrote *ch’*, *t’s*, etc.); instead of *shr*, I used *sh*, and *g* indicates the soft guttural *g* (in the Comparative Large Dictionary *γ*), *d*, *t*, *t*, *sh* represent the cerebral class of consonants. The vowels invariably have the Italian sound. This system of transliteration very nearly corresponds with the ordinary Ladakh pronunciation of Tibetan. It widely differs, as is well known, from the Lhasa pronunciation, but has the advantage of representing more accurately the spelling of Tibetan words, and of simplicity.

As I am not acquainted with Sanskrit, I had to rely upon the authorities adduced for any information derived from Sanskrit sources.

A small contingent of new Tibetan words and phrases will also be formed embodied and explained in these pages.

The notes appended at the end of the translation will, I trust, be found useful.

## A.

## Tibetan Text.

༡༡། རྩོད་པལ་འཁོར་བཅན། དེའི་སྤྲུལ་སྦྱིད་ལྷེ་ཉི་མ་མགོན་དང་། ཁྱི་  
 བཀྲ་ཤིས་རྩེགས་དཔལ་དང་གཉིས། སྦྱིད་ལྷེ་ཉི་མ་མགོན་ནི་བོད་ཁོང་ལོག་གི་  
 འབལ་ས་རྩལ་བཅན། ཁྲུང་མོ་ཉལ་བ། ལྷ་ཀ་བཟླ་གསུམ་གྱིས་གཙོ་བྱས་པའི་དྲ་  
 པ་བགྱ། ལྷོད་མངའ་རིས་སུ་བྱོན་པའི་ལམ་ཁར། ཉ་དང་སྒོ་ང་གསལ་དགོས་  
 བྱུང་ནས། དེར་རས་ཀྱིས་སྤར་ནས་དྲངས་པས་ད་ལྟ་བྱུང་རས་བོད་ཀྱི་གྱུ་ལ་པོའི་  
 ལྷགས་སུ་སོང་བ་ཡིན་ནོ། དེ་ནས་ར་ལའི་གྱུད་དུ་ཐེབས། དེའི་ལོ་ལ་མཁའ་དམར་  
 རྩེགས། ལྷག་གི་ལོ་ལ་རྩེ་ཤོ་གྱུ་རི་རྩེགས་ནས། དམ་ལག་གི་གཞུང་ནི་མས་ལ་ཡུལ་  
 དང་གོང་བྱིར་མང་པོ་བདུབ་དགོངས། མར་ཡུལ་ལ་གཞོད་པམ་མཛད། དེའི་དུས་  
 སུ་མར་ཡུལ་ལ་དྲགས་ལྷོད་གི་སར་གྱི་བགྱུད་པས་འཛོན། སྤྲོད་ནི་མས་རང་དགའི་  
 སིལ་བྱར་ཡོད་པ་ཡིན་ནོ། དེའི་ཆོ་དགོ་བ་ཤེས་བཅན་གྱིས་བྱ་བྱངས་སུ་ཞུས་ཏེ།  
 འཕྲོ་ཟ་འཁོར་སྦྱོང་བཅུན་མོར་སྤུལ་བ་ཁབ་དུ་བཞེས་པ་ལ། སྤྲུལ་གསུམ་བྱུང་ཞིང་།  
 སྤྲུལ་མཁའ་ཉི་ཟུངས་རྩེགས་ཏེ། གྱུ་ལ་ས་བདུབ་ནས། མངའ་རིས་སྒོར་གསུམ་ཆབ་  
 འོག་དུ་བསྐྱུས་ནས། གྱུ་ལ་སྤྲོད་ཆོས་བཞིན་དུ་བསྐྱུངས་སོ། སྤྲུལ་གསུམ་ནི།  
 ལྷ་ཆེན་དཔལ་གྱི་མགོན། བར་པ་བཀྲ་ཤིས་མགོན། ལྷུང་བ་ལྷེ་གཙུག་མགོན་དང་  
 གསུམ་མོ། དེ་ནས་སྤྲུལ་གསུམ་ལ་མངའ་རིས་སོ་སོར་གནང་ཞེ། ཆེ་བ་དཔལ་གྱི་  
 མགོན་ལ། མངའ་རིས་མར་ཡུལ། འབངས་གཞུ་ནག་ཅན། ཤར་ཅུ་ཐོགས་  
 དང་། གསེར་ཁ་འགོག་ལ་ད་ཀྱི་ལྷེ་མཆོག་དཀར་པོ། མཚོ་མས་ཀྱི་ར་བ་དམར་པོ།  
 ལྷམ་ལེ་ཡི་མིག་གི་པོ་བོང་ལ་མགོ་བར། ལུ་ཁ་ཆེད་ལ་ཙ། རྩོད་བཀའ་ཅན་ཡན་

ཆད། བྱང་གསེར་ཁ་འགོག་པོ་ཚུན་ཆད་ཀྱི་ས་གྲི་ལ་གདོགས་པ་ནི་མས་ཡིན་ནོ།  
 བར་པ་བཀྲ་ཤིས་མགོན་ལ། ལུ་གེ་བྱ་བྱངས། ཅེ་ནང་བཅས་པ་ལ་མངའ་མཛད།  
 རྒྱུང་བ་ལྷེ་གཙུག་མགོན་ལ། ཟངས་དཀར་སྒོ་གསུམ། སྤི་དེ། སྤི་ཐྱོགས་དང་  
 བཅས་པ་ལ་མངའ་མཛད། ཆེ་བ་དཔལ་གྱི་མགོན་གྱི་སྤྲས་འགོ་མགོན་དང་། ཆོས་  
 མགོན་གཉིས། འགོ་མགོན་གྱི་སྤྲས། ལྷ་ཆེན་གྲགས་པ་ལྷེ་༥ དེའི་སྤྲས་ལྷ་ཆེན་  
 བྱང་རྒྱལ་སེམས་དཔལ་༥ དེའི་སྤྲས་ལྷ་ཆེན་གྱི་ལ་པོ་༥ གྱུ་ལ་པོ་འདིའི་དུས་སུ།  
 ལྷ་འབྲིལ་གྱི་དགོན་པ་བཅུ་བ་ནས། དགེ་འདུན་གྱི་སྤེ་བཙུགས། གངས་རི་མཚོ་  
 གསུམ་དུ། མང་དུས་ལྷ་བཀྱི། རྒྱུང་དུས་བཀྱི་ཙམ་རི་སྤྱུབ་པ་མཛད་པ་ལ་འཚོ་  
 བའི་ཡོ་བྱང་སྒོ་དུབ་མེད་པར་ཡུན་རིང་དུ་མཛད་དོ། དེའི་སྤྲས་ལྷ་ཆེན་ཡུད་པ་ལ་༥  
 གྱུ་ལ་པོ་དེའི་དུས་སུ། ལ་དུགས་སྒྲིབ་གཤམ་གཉིས་ཀྱི་དམག་བསྐྱངས་ནས། རྒྱང་  
 དེ་ལ་བཀྱིབ། རྒྱང་དེའི་གྱུ་ལ་པོས་དེ་སེ་ནས་ཞུ་དང་། མ་པམ་ནམ་སྐམས་བར་དུ།  
 མཛོ་དང་ལྷགས་ལ་སོགས་པའི་ཁྲལ་དང་དབྱ་འབྲུལ་བའི་མནའ་བྱས་ནས། དུས་  
 ད་ལྷའི་བར་དུ་འང་ཡོད་དོ། གཞན་ཡང་སྒོ་པོ། བྱ་བྱངས་མན་ཆོད། ལྷེ་ཕྱོགས་བྲེ་  
 སྤང་གི་ཡུལ་རྒྱ་ལ་མེ་འབར་ཚུན་ཆོད། ལུ་བ་ཕྱོགས་ར་གན་འབྱེང་གིང་། ལྷག་ཁྲ་  
 ཚུར་ཡན་ཆོད། བྱང་ཕྱོགས་ཀ་ཤུས་ཡན་ཆོད་མངའ་འོག་དུ་བསྐྱས་དེ། ཡོ་རི་ལ་  
 ཁྲལ་སོགས་འབྲུལ་ཞིང་། ཞལ་ལྷ་བྱ་ཡོང་བ་ཡོད་དོ། དེའི་སྤྲས་ལྷ་ཆེན་ནག་ལྷག་༥  
 གྱུ་ལ་པོ་དེས་སྤྲག་གི་ཡོ་ལ་ལྷན་ལར་མཁར་རྩིགས། འབྲུག་གི་ཡོ་ལ་ཁ་ལ་རྩེ་  
 རྩིགས་སོ། དེའི་སྤྲས་ལྷ་ཆེན་དགེ་སྤྱོད་དང་། དགེ་འབྲུམ། དེའི་སྤྲས་ལྷ་ཆེན་

༡ འགོ་མགོན།

༢ ལྷ་ཆེན་གྲགས་པ་ལྷེ།

༣ ལྷ་ཆེན་ཐང་རྒྱལ་སེམས་དཔལ།

༤ ལྷ་ཆེན་རྒྱལ་པོ།

༥ ལྷ་ཆེན་ལྷུང་པ་ལ།

༦ ལྷ་ཆེན་ནམ་ལྷག།

༧ ལྷ་ཆེན་དགེ་སྤྱོད།

མོང་། དེའི་སྐས་བཀྲ་ཤིས་མགོན་། (དེའི་སྐས་ལྷ་གྲུལ་།) གྲུལ་པོ་འདིས་  
 གྲུང་དོ་ཆེ་ཅེ་མོ་དང་། ངན་སོང་སྤྱོད་བའི་གྲུང་། གྲུང་འབྲུམ་ཚང་བ་གསེར་ལ་  
 བཞེངས་སོ། དེའི་སྐས་ལྷ་ཆེན་ཆོ་དཔལ་། གྲུལ་པོ་འདིས་ཆོས་ཁྲིམས་དང་གྲུལ་  
 ཁྲིམས་ཀྱི་མཛད་པ་མཐར་ཐིན་པར་མཛད་དོ། དེའི་སྐས་ལྷ་ཆེན་དངོས་གྲུབ་།  
 གྲུལ་པོ་དེའི་དུས་སྤྱི་རབ་དུ་བྱུང་བ་དབྲུས་གཙང་དུ་འགྲོ་བའི་སྤྱི་ལ་བཙལ་ས་ནས།  
 ཡབ་མེས་ཀྱི་གཙུག་ལག་ཁང་ནི་མས་ཞིག་བསོས་མཛད་པ་དང་། བྱད་པར་དུ་ཆོས་  
 ཀྱི་ཆེ་འཛིག་དེན་གསུམ་གྱི་མགོན་པོའི་དྲུང་དུ། གསེར་དབྱལ་རངས་བྱི་ཅུ་ཐུད་ཀྱི་ག་  
 ལ་སོགས་པའི་བགྲུ་འབྲུལ་དང་། བཀའ་འབྱུང་ཚར་གཉིས་དང་། གསང་སྤྲུགས་  
 ཀྱི་དགྲིལ་འཁོར་མང་དུ་བཞེངས་སོ། དེའི་སྐས་ལྷ་ཆེན་གྲུལ་བྱ་རིན་ཆེན་། དེའི་  
 སྐས་ལྷ་ཆེན་ཤེས་རབ་། གྲུལ་པོ་དེའི་རིང་ལ། ས་བུའི་ཉང་ཅེ་མ་ཞེས་པའི་ཁ་ལ་  
 གོང་ཁྱེར་སོངླ་སྤང་ཞེས་པ་ཅིག་ས་ནས། མར་ཡུལ་ས་བུ་སྤྱང་མཁར་དུ་བདག་ས་  
 སོ། དེའི་སྐས་ལྷ་ཆེན་ཁྲི་གཙུག་ལྷེ་། གྲུལ་པོ་དེས་སྤྱི་ལ་དུ་མཆོད་དེན་བགྲུ་ཅ་  
 བཞེངས་། ས་བུ་ཅུ་བགྲུ་ཅ་གཉིས་བཞེངས་སོ། དེའི་སྐས་ལྷ་ཆེན་གྲགས་འབྲུམ་  
 ལྷེ་ལྷང་། གྲགས་པ་འབྲུམ་གཉིས་། གྲགས་འབྲུམ་ལྷེས་སྤྱི་ལ་ལ་སོགས་པ་ལ་  
 མངའ་མཛད་ནས། གྲུམ་ཕུག་ཆེས་སྤྱི་གཙུག་ལག་ཁང་དམར་པོ་བཞེངས་ནས།  
 གྲུལ་བ་བུམས་པ་མགོན་པོ་དགའ་ལོ་བགྲུང་པའི་སྤྱོད་ཚད་དང་། གཡས་གཡོན་  
 གཉིས་སྤྱི་འཇམ་དབྱངས་ཕུག་ན་དོ་ཆེ་གཉིས་ཐོག་ཚད་རེ་བཞེངས་། ལོགས་བྱིས་

༡ ལྷ་ཆེན་ཆོ་མོར་།

༢ (ལྷ་ཆེན་) Schl.

༣ ལྷ་ཆེན་དངོས་གྲུབ་།

༤ ལྷ་ཆེན་ཤེས་རབ་། ༥ ལྷ་ཆེན་ཁྲི་གཙུག་ལྷེ་།

༦ བཙུམ་མགོན་།

༧ ལྷ་ཆེན་ཆོ་དཔལ་།

༨ ལྷ་ཆེན་ཆེན་པོ་ལྷ་ཡིན་།

༩ ལྷ་ཆེན་གསལ་འབྲུམ་ལྷེ་།

རྣམས་ལ་བདེ་བར་གཤེགས་པ་རྣམས་ཀྱི་འདྲ་སྐྱ་དང་། འཛིག་རྟེན་བརྟན་བཞག་  
 དང་། རང་ཉིད་མོས་པའི་ལྷ་རྣམས་ཚང་བ་དང་། ལྷ་ཁང་གསུམ་ཅེགས་མཐོ་སྒོང་  
 གི་དཔེ་བཞེངས། གསུང་གི་རྟེན་དུ་གཟུངས་འབུམ་ཆེན་མོ་དང་། དཀོན་མཆོག་  
 ཅེགས་པ་ཡང་ཀར་གཤེགས་པ་ལ་སོགས་བཞེངས། བྲགས་ཀྱི་རྟེན་ལ་དེའུ་སེར་  
 པོ་སྒྲམ་འུལ་ལ་བཞུགས་པ་ཞིག་ཡོད་པས་གདུམ་ནས། སྤྱི་མཆོད་རྟེན་གྱི་ཚུལ་ལ།  
 རང་ལྷ་ཁང་བརྒྱ་ཙམ་ཡོད་པ་བཞེངས། མཆོད་རྟེན་གྱི་མིང་དེའུ་བཀྲ་ཤིས་འོད་འཕྱོ་  
 ཟེར། གཞན་ཡང་སྒྲམ་མདོ་དེ་ན་དེའུ་སྒྲང་པོ་ཆེ་འདྲ་བ་ཡོད་པ་ལ། གྱུལ་པོ་དེས་  
 རི་མ་གྱི་ལ་དགོ་སྒོང་བཞི་སྟེ་གཅིག་བཅུགས་ནས། ཤི་ཡང་འགྲོད་པ་མེད་གསུང་  
 བ་ལ། སྟིགས་དུས་ཀྱི་ཀུན་མཁུན་ཚོང་ཁ་བ་ཆེན་པོ་སྒོ་བཟང་གྲགས་པས་རང་གི་  
 འདས་ཁྲག་ལ་འབྲུངས་པའི་ཆོ་དབག་མེད་མཐེབ་ཆོགས་ཙམ་ཡོད་པ་བྱ་བལ་  
 གཉིས་ལ་བསྐྱར་ནས། ཡང་ན་གྲགས་པའི་མཚན་ཅན། ཡང་ན་ལྗེའི་མཚན་ཅན་  
 ལྷག་དུ་ལྷལ་གསུང་བ་ལ། ཁོང་གཉིས་མར་ལྷལ་དུ་སྒྲེབ་ནས། ལུབ་ར་ན་གྲགས་  
 པ་ཞེས་བྱ་བ་ཡོད་པ་ལ། ཁོང་གི་བྱང་དུ་ཕྱིན་པས། བྱ་བལ་གཉིས་ལ་སྐྱུན་མིག་  
 ཅམ་ཀྱང་མ་གཟིགས་པར། སྒྲེལ་དུ་ཡོངས། དེའི་ཐོ་རངས་གྱུལ་པོའི་ཞལ་ནས།  
 དེ་རིང་ངའི་ཞལ་ལྟ་བུ་ལ། བྱ་བལ། སྒྲེད། མོན། ཏི་ཤི་སྤུ་ཡང་མ་བཀག་གསུང་  
 བས། བྱ་བལ་གཉིས་བྱང་བར། གྱུལ་པོ་བཞེངས་ནས་བྱ་བལ་གཉིས་ལ་བསྐྱབ་  
 མཛད། བྱ་བལ་གཉིས་ཀྱིས་ཀྱང་སྐྱེས་སྤུལ་བས། གྱུལ་པོ་ཤིན་དུ་དགོས་ཏེ།  
 མངས་གྱིས་ཀྱི་བསྟན་པ་རིན་པོ་ཆེ་ལ་དཔེས་ནས། དཔེ་བུ་གྱི་དགོན་པ་མ་ཅིགས་  
 ལྷན་གྱིས་གུབ་པ་དེ་ཅིགས་ནས་དགོ་འདུན་གྱི་སྟེ་མང་པོ་བཅུགས་སོ། དེའི་སྤྲས་  
 སྒོ་གྲས་མཆོག་ལྟ་ན། གྱུལ་པོ་འདིའི་དུས་སུ། གྲག་ནས་དཔྱད་ཁྲིམ་ཐེལ་བ།

མ་མེད་ཐུན་སྦྲིབས། བྲལ་རྒྱུད་དཀའ་བླ། ལྷ་ཁྲལ་དཀའ་པོས་གཙོ་བྱས་ཁྲལ་བཙོ་བྱའོ། ལྷ་མ་ཁལ་ཁྲལ་ལྷ་ལ་འབྲོང་ཅེ་རིངས། སྒོ་ལ་དམར་མེ་གསོད་ལ་སོགས་པའི་རལ་གྱི་བཙོ་བྱའོ། བདུད་གྱི་ནལ་པོ། དམ་གྱི་གཞུང་བཙོད་ནམས་ཀྱིས་མགོ་བྱས་པའི་སྦྱེད་གྱི་བཙོ་བྱ། ལྷ་གཡུ་འོད་ལྷན། ལྷ་གཡུ་དཀའ་པོས་གཙོ་བྱས་གཡུ་བཙོ་བྱ། ལྷ་མ་ཇི་ཁྱི་ཕྱེངས། བཀྲ་ཤིས་འོད་ལྷན་སོགས་སྒྲ་ཉི་ཤུ། ཆིབས་གོ་བོ་ལྷ་བཅུ། ངང་པ་ལྷ་བཅུ། འོལ་བ་ཉི་ཤུ། ཁྲ་བོ་སྦྱུ་མ་ཅུ། འཁྱི་ཟམ་མོ་ཉི་ཤུ། གཡལ་གཡལ་བ་ཉི་ཤུ། ལྷ་གཡུ་སོགས་པའི་ཁྲལ་དབྱུ་འབྱལ་བ་མང་པོ་དང་། མངའ་རིས་སྒོར་གསུམ་ཆབ་འོག་དུ་བསྐྱས་ནས་དར་ཞིང་གྱིས་པ་ཡིན་ནོ།

ལྷ་ཆེན་གཤགས་པ་འབྱུང་གྱིས། རབ་བདེན་ལྷ་ཅེ་དང་། གཏེ་ཡ་སོགས་ལ་མངའ་མཛད། གྱུ་ལ་ས་གཏིང་སྒྲང་ཅིགས། དེའི་སྤས་ལྷ་ཆེན་གླུ་ར། དེའི་སྤས་ལྷ་ཆེན་གླུ་གན་། གྱུ་ལ་པོ་དེ་འབྲུག་པ་ལ་ཤིན་དུ་དཀའ་བ་ཅིག་ཡོད་པས། ཤེལ་བ་དང་བསྐྱོངས་ནས། སྤེའི་གྱུ་ལ་པོ་གཤགས་འབྱུང་མེདེ་སྤས་བྱ་སྒོ་གོས་མཆོག་ལྷན། དུང་པ་ཨ་ཡི། སྤབ་བསྟན་དར་གྱིས་ནམས་པལ་ནས་མངའ་འོག་དུ་བསྐྱས། དེའི་སྤས་ལྷ་ཆེན་ལྷ་དབང་ནམ་གྱུ་ལ་དང་། བཀྲ་ཤིས་ནམ་གྱུ་ལ་གཉིས་༥ ལྷ་དབང་ནམ་གྱུ་ལ་དེ་སྦྱ་སྦྱོབས་དང་སྦྱ་ཅལ་ཤིན་དུ་ཆེ་བ་ཞིག་ཡོད་པ་ལ། རྒྱུད་བ་བཀྲ་ཤིས་ནམ་གྱུ་ལ་གཡོ་ཆེ་བ་ཡོད་པས། ཇོ་བོའི་སྦྱན་བདེན་ནས། གདུང་བཙོད་གྱི་ཕྱིར་བཙོན་མོ་དང་བཅས་ནས་ཡིངས་སྦྱེད་དུ་བཞག་གོ། དེའི་སྤས་ལྷ་ཆེན་ཆོ་དབང་ནམ་གྱུ་ལ། ལྷ་མ་གྱུ་ལ་མགོན་པོ། འཇམ་དབྱངས་ནམ་གྱུ་ལ་དང་གསུམ་འབྲུངས་སོ། སྤས་གསུམ་པོ་དེ་སྦྱ་སྦྱེད་ཤིན་དུ་ཆེ་བས། གཞན་གྱི་ཡོ་སྦྱེད་པས་ཁོང་གི་རྒྱ་སྦྱེད་ཆེ་

\* More correctly : དཀའ་པོ་ནམས་ཅིས།



གཞན་གྱི་རྒྱ་རྒྱུད་པས་ཁོང་གི་ཞབས་སྤྱོད་ཆེ་བར་བྱུང་ངོ་། དེའི་དུས་སུ་གྲུ་ལ་པོ་བཟླ་  
 ཤེས་ནས་གྲུ་ལ་གྲིས་གྲུ་ལ་སྤྱོད་མཛད་དོ། གྲུ་ལ་པོ་དེས་བྱ་རིག་གུན་ཆད། གྲོ་ཤོད་  
 མན་ཆད་མངའ་ལོག་དུ་བསྐྱུས་ནས། ཉ་ཁྱུ་བསམ་གྲིས་མི་ཁྱབ་པ་ཁྲིངས། སྐྱུ་མཁའ་  
 སྤྱོད་ནས་གྲུ་ལ་རྩེ་མོ་དང་། རྩེ་ལྷོ་ཤོང་ཁྲིར་བཏབ། རྩེར་གྱི་དམག་བྱུང་བ་ལ་འཕམ་  
 པས། རྩེར་མང་པོ་བསམད། རྩེ་ལྷོ་ཤོང་མོར་མགོན་ཁང་བཞེངས་ནས། རྩེར་གྱི་  
 རོ་ཐམས་ཅད་མགོན་པོའི་ཞབས་ལོག་དུ་མནན། (གཞན་ཡང་མགོན་ཁང་བཞེངས་  
 མཐའ་དམག་རྒྱོག་པའི་སྤྱི་མནན་\*) །) འབྲི་ཁང་ནས་ཆོས་རྒྱུ་ལ་ཞེས་པའི་  
 སངས་གྲུ་ས་དངོས་དེ་གདན་དྲངས་ནས། སྐང་རྩོན་པ་བཟླ་ཤེས་ཆོས་རྒྱུ་ལ་ཞེས་པའི་  
 དགོན་པ་བཏབ། ཡུལ་ཡུལ་ནས་བཅུན་ཁྲུ་ལ་བཏབ་ནས། བསྐྱུ་བྱིད་ཀྱི་བསྐྱུ་ན་པ་  
 བཅུགས། དགོན་པ་མཐོང་བའི་ས་མཚམས་སུ་དར་ཆེན་འཕྲུར་ནས། འདིའི་  
 མདུན་དུ་ཀྱན་མ། རྩོན་མ། མདོར་ན་གྲུ་ལ་པོའི་སྐྱུ་མཁའ་སྐྱུ་སྤྱོད་ལ་བསྤོས་པའི་  
 མི་ཡོད་ཀྱང་། དེའི་མདུན་དུ་རྩེ་པ་ཅས་གྲིས་གཞག་ལས་ཐར་བར་མཛད་དོ། གཞན་  
 ཡང་འབྲི་ཁང་། ས་སྐྱུ། དགོན་པ་རྩོན་པ་སྤྱོད་ལས་ནས་སུ་གདན་བཞུགས།  
 གསེར་ཆབ། དར་ཆེན། མང་མ། བསྐྱུ་འབྲུལ་སོགས་དང་། བཀའ་འབྲུར། བསྐྱུ་  
 འབྲུར། གཞན་ཡང་སྤྱོད་ལས་བསམ་མང་པོ་དང་། མཆོད་རྟེན་མང་པོ་བཞེངས་སོ།  
 དེ་ནས་སྤྱོད་ལས་པའི་གྲུ་ལ་པོ་ཆོ་དབང་ནས་གྲུ་ལ་དེ་གྲུ་ལ་སྤྱོད་ལ་མངའ་གསོལ་ནས།  
 སྐྱུ་ན་གཞོན་དུས་དམག་མཛད་པས། ཤར་ངམ་རིངས་མན་ཆད། རྩོ་བོ་དང་།  
 བྱ་ཤངས། གྲུ་གེ་ལ་སོགས་པ་མངའ་ལོག་དུ་བསྐྱུས། རྩོ་ཕྱོགས་འཛུལ་ལང་།  
 ཉུང་དེ། ལུ་ཕྱོགས་ཤི་དཀར་དང་། ཁ་དཀར་རྩོན་ཆོད་མངའ་ལོག་དུ་བསྐྱུས།

\* From MS. B only.

† (read རྩེ་ལྷོ་ཤོང་)।

བྱང་རྩོད་ལ་དམག་གྱིབ་གསུང་བ་ལ། ལུབ་ར་བ་རྣམས་ཀྱིས་ཞུ་བ་ཕྱལ་ནས་ས་  
 མཛེད། གཞན་དེ་རྣམས་ཀྱི་རྩོག་ན་གཏེ་བ་ལ་བྱོངས། མཁར་རྣམས་ལ་སྦྲུལ་བ་  
 བཞག་ནས། མར་ཕྱལ་ཐམས་ཅད་དར་ཞིང་གྱིས་པ་ཡིན་ནོ། བྱ་བོ་ནས་ཁྲལ་དང་  
 དཔྱའ་བྱལ་བ་ལ། ལོ་རེ་ལ་གསེར་ཞེ་སྤུམ་བཟྱ། ཅུ་ཐོགས་ནས་གསེར་ཞེ་ཉི་བཟྱ་  
 དང་དུག་ཅུ། ཚོར་མོ་བཟྱ། ཆིབས་གཅིག། བཙོས་ཀྱི་སྦྱལ་པ་བཅུ། འཁར་ཡོ་རྩེང་  
 དང་། ཞིང་དར་ཆེན་དར་རྒྱུང་རྣམས་དང་། གཞན་ཡང་ཁྲལ་དཔྱའ་ལོགས་ཕྱོགས་  
 ཕྱོགས་ནས་འབྱལ་བ་བསམ་གྱིས་མི་བྱབ་པོ། གྱུ་ལོ་པོ་དེའི་ཐུགས་དགོངས་ལ།  
 ལྷ་ས་དང་། བྱ་གཤེ་མཐོ་སྤྱིང་རྣམས་ཀྱི་ཐིག་ཚད་བྱས་ནས། སྤར་ཡབ་མེས་རྣམས་  
 ཀྱིས་སངས་གྱིས་ཀྱི་སྤྱང་པོའི་གདུང་ཡང་ཅེ་མོར་བཞག་པས། མི་རྣམས་ཀྱིས་  
 མཇུག་པ། ཕྱག་མཆོད་པ། སྐོར་བ་སོགས་མི་འགྲོ་བ་འདུག་པས། དངས་དེའི་  
 ཚབ་ལ་གཙུག་ལག་ཁང་བཞེངས་ནས། སངས་གྱིས་ཀྱི་བསྟན་པ་མེས་རལ་བ་ཅན་  
 ལྷ་བྱ་ཅིག་བྱེད་དགོས་དགོངས་པ་ལ། སེམས་ཅན་གྱི་ལས་ཟད་པས། གྱུ་ལོ་  
 པོ་དེ་སྦྱོབ་དེ་བར་གཤེགས་སོ། དེ་དང་གྱུ་ལོ་ཐུན་རྣམས་ཕྱོགས་ཕྱོགས་ནས་ལངས།  
 དེ་ནས་འཇམ་དབྱངས་རྣམས་གྱུ་ལོ་གྱིས་གྱུ་ལོ་སྤིད་མཛེད་པོ། གྱུ་ལོ་པོ་དེའི་དུས་བྱ་སྤྱ་  
 རིག་གི་རྩོག་ཉིས་མ་མཐུན་ནས། ཚོ་རིང་མ་ལོག་ཟེར་བ་ཅིག་གི་དཔྱང་ལ་ལ་དུགས་  
 ཀྱི་དམག་བྱིར་བས། དུས་ཀྱི་འགྲིབ་དུས་དང་། གྱུ་ལོ་བྲིས་ཀྱི་ཉམས་དུས་ལ་  
 བབ་པས། ལང་གོང་དམག་དཔོན་ཨ་ལི་མིར་གྱི་དམག་རྩོལ་བ་དང་ཐུག། ཁོ་ཡིས་  
 གཡོ་བྱས་ནས་ཞག་ཅི་འགྲོ་བྱས། དེ་དང་ལ་ཕྱང་ཐམས་ཅད་ཁ་བས་བཀག་ནས།

\* Schl's MS. (རྩོག་ན་) དང་ངན་མེད་པའི་བཀའ་ཐུག་མཐེ་པ་ལ་བྱོངས།

† Schl's MS. here adds འགྲོ་བ་ལེམས་ཅན་གྱི་དོན་དུ།

༡ འཇམ་དབྱངས་རྣམས་ཆུལ།

གྲིལ་པོ་དམག་དང་བཅས་པ་གར་ལོག་ལ་ཡལ། ལ་དྲལ་ས་ཐམས་ཅད་ལ་སྤྱལ་གྱི་  
 རྒྱལ་ས་ནས། གསུང་རབ་ཐམས་ཅད་མེ་ལ་བསྒྲིགས། ལ་ལ་ཆབ་ལ་བཀལ། གཞུག་  
 ལག་ཁང་ཐམས་ཅད་བཞག་ནས། རང་གི་ཡུལ་ལ་ལོག་སོང་། དེ་ནས་ཨ་ཡི་མིར་  
 ཤེར་ནན་གྱི་སྤྲས་མོ་གྲིལ་ཁ་ཐུན་ཞེས་པ་སྒྲོལ་མ་དཀར་མོའི་རྣམ་སྤྱལ་པ་དེ་འཇམ་  
 དབྱངས་རྣམ་གྲིལ་ལ་བཅུན་མོར་ཐུལ་ནས། (བཞུགས་པའི་རིང་པོ་མ་ལོན་པར་  
 ཨ་ཡི་མིར་གྱིས་སྤྲི་ལས་དུ། ཁོང་རང་གི་མཁར་ཡོག་གཙང་པོ་ལས་སེདྤེ་ཅིག་  
 ཐོན་ནར་གྲིལ་ཁ་ཐུན་ལ་(ཐིམ་)\*པར་མཐོང་བ་དང་དུས་མཚུངས་གྲིལ་ཁ་ཐུན་ལ་  
 སེམས་ཅན་དང་ལྡན་པར་གྱུར། དེ་ནས་ཨ་ཡི་མིར་གྱིས་འཇམ་དབྱངས་རྣམ་གྲིལ་  
 བྱི་ཐྱེང་དུ་བཞུགས་སུ་གསོལ། དམག་རྣམས་ལ་སྒྲོན་མོ་བྱས་ནས། གྲིལ་ཁ་ཐུན་  
 ཀྱང་གྱུན་དུ་མས་བགྱན་ཏེ་ཨ་ཡི་མིར་གྱིས་གསོལ་བ། ཁ་སང་ངས་སྤྲི་ལས་དུ་  
 མདུན་མཚོ་ནས་སེདྤེ་ཅིག་ནར་གྱིས་མཚོངས་ནས། གྲིལ་ཁ་ཐུན་ལ་(ཐིམ་)\*\*པར་  
 མཐོང་། དེ་དང་དུས་མཚུངས་བྱ་མོ་འདི་ལའང་སེམས་ཅན་དང་ལྡན་པར་གྱུར།  
 འདི་ལ་བྱ་ཞིག་ངས་པར་སྐྱེ་མིང་དུ་སེདྤེ་རྣམ་གྲིལ་ཐོགས་ཟེར་ནས། ལ་དྲལ་ས་ཀྱི་  
 དམག་དང་བཅས་གནང་ནས་གྲིལ་སྤིད་ལ་དབང་བ་ཡིན་ནོ།† དེ་ལ་སྤྲས་གཉིས་  
 འབྱུངས་ཏེ། སེདྤེ་རྣམ་གྲིལ་དང་། རྟོར་བྱ་རྣམ་གྲིལ་གཉིས་སོ། དེའི་དུས་སུ་འཇམ་  
 དབྱངས་རྣམ་གྲིལ་གྱི་ཐུགས་དགོངས་ལ། དང་པོ་ངས་བྱ་རིག་ཚོ་རིང་མ་ཡིག་གི་  
 དབྱང་ལ་དམག་བྱིར་བའི་ལན་ལ། ལ་དྲལ་ས་ཐམས་ཅད་ཞིག། དངས་སངས་  
 གྱིས་ ཀྱི་བསྟན་པ་དར་བའི་ཐབས་ཤིག་ཅི་བྱས་ནས་དར་བར་བྱ་དགོས་པ་ལ།

\* This word is torn off in the MS. I give the word which, according to popular belief, would be the correct rendering.

† This entire passage is omitted in all the MSS. but B, neither is it contained in Sohl's edition.

མངས་གྲིས་ཀྱི་བཟུན་པ་མི་སྡེ་ལ་རག་ལས་བཤེན་པས། དངས་མི་སྡེ་ལ་ཁྲལ་  
 བྱེད་སྟོན་པ་མེད་པ་བྱ་བཞིན་བསྐྱང་དགོས་སྟུང་ནས། ཡུལ་ཁྲོགས་ལན་གསུམ་  
 སྟོན་པ་ནས། གྲུ་པོ་འདིས་བྱ་རིག་གཉིན་ཆད། བྱང་ཅེ་མན་ཆེད་མངའ་འོག་དུ་  
 བསྐྱུས་ནས། གྲུ་ལ་ཁ་ཐུག་གི་སྡོན་དུ་འཛིག་དེན་དབང་ཡུལ་གི་སྲས་མོ་ཆོ་རིང་གྲུ་  
 མོ་ཁབ་དུ་བཞེས་པ་ལ། སྲས་ངག་དབང་ཞོམ་གྲུ་པ་དང་། བཟུན་འཛིན་ཞོམ་གྲུ་  
 གཉིས་འབྲུངས། གཞན་ཡང་སྲས་འདི་གཉིས་ཀྱིས་དབྱས་གཙང་དུ་ཆོ་བོ་རིན་པོ་  
 ཆེདི་དུང་དུ་གསེར་ཆབ། གདན་བཞུགས། འབྲས་སྦྱངས། ར་ལྷང་ཞོམས་སྦུ་  
 གསེར། དངུལ། རྩ་དྲིལ། བྱི་ཅུ། སྟོས་ཤེལ། ཅབ་དར། མང་ཇ་ལ་སྟོགས་པའི་  
 བགྱེད་འབྲལ། དེ་ཞོམས་སྦུ་དར་ཆེན་དང་། འབྲུག་པ་སྦྱུ་ལ་ཁ་ཐུག་འདྲེན་པའི་པོ་  
 ཉ་སྟོགས་ཀྱང་ཇིངས་སོ། སྐྱའི་གྲི་མར་གྲི་དོག་གསེར་གསུམ་དང་། དཀར་གྲི་དུ་  
 གསེར་འབྲིང་སྟོགས་གསེར་དངུལ་ཟངས་གསུམ་ལ་བཞེངས་ནས། གྲི་མ་ཡུག་  
 ཇིས་སྦུ། སྦྱུ་ལ་དྲིས་མེ་ལ་བསྟེགས་པ་ཞོམས་སྦུ་ར་དེདི་ཆབ་བཞེང་བའི་ཐུགས་  
 བསམ་ཤིན་དུ་ཆེ་བ་ཡོད་ཀྱང་། སྐྱ་ཆོ་ཐུང་བས་བདེ་བར་གཤེགས་སོ། དེདི་སྲས་  
 ཆོས་ཀྱི་གྲུ་པོ་སེདྤེ་ཞོམ་གྲུ་པ་འདི་ཆུང་ཅུདི་དུས་ནས་སྐྱ་ཕྱོགས་ཤིན་དུ་ཆེ་བས།  
 བྱད་དང་། བང་དང་། མཆོང་དང་། མདའ་དང་། སྟོག་དང་། ཉི་སྦྱ་དང་། སྦྱ་ཅུལ་  
 ཐམས་ཅད་སྡོན་གྱི་ཟས་གཙང་སྲས་པོ་དོན་གྲུབ་ལྟ་བུའོ། གྲུ་པོ་དེས་སྐྱ་ན་གཞིན་  
 ལུལ། གུ་གེ་ཕྱི་འབྲོག་ལ་དམག་མཛད་ནས། དེ་སེདི་བྱང་གྲུ་པ་ཚུན་ཆེད་ལ་བགྱེད།  
 ཉི་གཡག་ར་ལུག་ལ་སྟོགས་པ་ས་གཞི་གང་\*ནས་བྱོངས། དེདི་དྲིང་གུ་གེ་ནང་ལ་

༡ སྡེ་མེལ།

\* Schl.'s edition and MS. B have both བྱས་དང་ which may also be correct.

དམག་མཛད་ནས་ཤ་ཤང་དང་ཞལ་གཉིས་མར་ཇག་ལ་བདང་ནས། ལ་དྲགས་  
 ཐམས་ཅད་གཡག་ལྷག་གིས་ཁིངས། ཅུ་ཤོད་བདག་མོ་བསྐལ་བཟང་སྒྲོལ་མ་གྱི་ལ་  
 མོ་ཁབ་དུ་བཞེས། ལྷ་བ་ཐོབ་ཀྱི་གྱི་ལ་པོ་སྤྲག་ཚང་རས་ཆེན་ཞེས་བྱ་བ། གྱི་གར།  
 ཨོ་གྱིན། ཁ་ཆེ་སོགས་དང་། ལྷ་བ་ཐོབ་བཤྱིད་ཅུ་ཐམས་ཅད་ཀྱི་ཞལ་མཛོད་སྤྲུམ་དུ་  
 གཟིགས་པའི་འཇའ་ལྷས་ལྷ་བ་པའི་སངས་གྱིས་དེ་གདན་དྲངས་ནས། ཡབ་ཀྱི་  
 དགོངས་ཇོགས་ལ་བབ་སྒྲོར་གསེར་རངས་ཀྱི་བྱམས་པ་དགའ་ལོ་བཤྱིད་པའི་སྤྱི་  
 ཚད་རིན་པོ་ཆེ་སྒྲུ་ཆོགས་ཀྱིས་སྤྲུམ་པ་དང་། གྱི་གར་ཤར་རྒྱབ་ཐམས་ཅད་ཀྱི་གྱི་སྒྲ་  
 ཐམས་ཅད་གདན་དྲངས་ནས། བྱམས་ཆོས་སྤེལ་པོ་དེ་ལྷ་བཞེངས། གྱི་ཚོད་དགེ་  
 སྒྲོང་ལྷ་བསྐལ་པ་ནམ་གནས་སུ་བཅུགས་ནས། མཚོད་པ། མར་མེ་ཉིན་འབར་  
 མཚན་འབར། གྱི་གོས་ཡམ་མཚན་པ་མང་པོའི་ཕན། གྱི་ཡམ་མཚན། དར་ཆེན་ལ་  
 སོགས་པ་བཅུགས། གཞན་ཡང་འཕགས་པ་རབ་འབྱོར་གྱི་སྤྱི་ལྷོ་བཟོ་བཟོ། པཎ་  
 ཆེན་ཆོས་ཀྱི་གྱི་ལ་མཚན་གྱི་སྤྱི་དྲུང་དུ། ཡུམ་གྱི་དགོངས་ཇོགས་ལ། གསེར་གྱི་  
 འབྲུམ་ཚང་དང་། དུལ་གྱི་འབྲུམ་ཚང་། སྒོས་ཤེལ་ཀུ་ཤུ་ཅམ་བཤྱི་ཙྰ། དེ་བས་  
 སྤྲ་བ་བཤྱི་ཙྰ། ཕྱི་ཅུ་བྱ་མེད་ལྷོ་ང་ཅམ་བཤྱི་ཙྰ། སྤྱི་ཤེལ་བཤྱི་སྤན་ཅམ་བཤྱི་ཙྰ་  
 དང་། གཞན་སྤྲ་མོ་མང་པོ་དང་། (.....) ལྷ་ས་ཁྲ་འབྲུག་བསམ་ཡས་སོགས་ལ་  
 སྒྲོང་མཚོད། དགེ་འབྲུམ་སེར། འབྲུག། ར་ལྷང་། ས་སྤྱ། གཞན་ཡང་དགོན་སྤེ་  
 ཆེ་སྤྲ་ཐམས་ཅད་ལ་བཤྱི་འབྲུལ་མང་སྒྲོལ་བཅས་གྱི་ཆེ་བ་དང་།) ལྷ་བ་ཐོབ་སྤྲག་  
 ཚང་རས་ཆེན་དེ་ཉིད་ལ་རང་ཞབས་ཀྱི་ཡུལ་ཁག་སོ་སོ་ནས་ས་སྤྱད་མཚོད་གཞིས་

\* MS. A has དམའ་ཇག།

† MS. B, i. e., སྤྱི་ལྷོ་བཟོ་བཟོ་ has སྤྱི་ལྷོ་བཟོ་བཟོ་།

‡ Passage in B only; the first word is illegible.

སོགས་གྱི་ཆེ་བ་འབྱུང་ནས། ལྷག་ཚང་རས་ཆེན་གྱིས་ལྷམ་ལེ། བཀྲ་ཤིས་སྒྲང་།  
 ཉེ་མི། ཐེག་མཆོག་ལ་སོགས་པའི་དགོན་སྡེ་ཞིགས་། ཡབ་སྤྲོ་ཞིས་གྱི་ལ་དང་།  
 སྤུ་བདེ་ལྷན་ཞིས་གྱི་ལ་གཉིས། ཡབ་ཀྱི་སྤྱོ་ཆེ་སྤྲ་དང་། སྤུ་བདེ་ལྷན་ཆེ་སྤྲ་  
 སྤུ་བདེ་ལྷན་ཆེ་སྤྲ་དང་། སྤུ་བདེ་ལྷན་ཆེ་སྤྲ་དང་། སྤུ་བདེ་ལྷན་ཆེ་སྤྲ་  
 (གྱི་ལ་ཁམས་ཐམས་ཅད་དགོན་བཅུ་འདྲེ་ཁྲིམས་ཀྱིས་འཛོལ་ཞིང་། འཛིག་ཉེན་གྱི་ཁམས་  
 སྤུ་ཡང་གྱི་ལ་པོ་སྤྲོ་འདྲ་བ་ལ་སྤྲོ་མ་སྤྲོ་འདྲ་བ་མཆོད་ཡོན་ཉི་ལྔ་རྩ་བཅུ་གཅིག་  
 ཅེས་གྲགས་པས་ས་སྤྲོ་བྱུང་བར་གྱུར། དེ་ནས་སྤྲོ་ཞིས་གྱི་ལ་གྱི་དགོངས་པ་ལ།  
 ཡབ་ཆེན་ཆོ་དབང་ཞིས་གྱི་ལ་གྱིས་ཤར་བྱང་ངམ་རིངས་རྩལ་མངའ་མཛད་ཀྱང་།  
 སྤྲོ་ཆེ་ཐུང་བས། ཡབ་འཇམ་དབྱངས་ཞིས་གྱི་ལ་གྱི་དུས་སྤུ་གྱི་ལ་སྤུ་ཐམས་ཅད་  
 ལངས་འདུག\* ) སྤུ་ཡང་བྱང་ངམ་རིངས་སྤྲོ་ཐམས་ཅད་ལ་ཆས་པས། ཤི་རི་  
 དཀར་མེར་ཆགས། དེ་ནས་བོད་ནས་པོ་ཉ་འབྱོར་ནས། སྤུ་གྱི་གཙོད་མཆོམས་ན་  
 དབྱ་གཙང་སོ་རྩལ་མངའ་ཞབས་སྤུ་བསྤུས། སྤུ་ལོག་པེབས་སྤུ་བསྤུས་ལེར་སྤུ་  
 བདེ་བར་གཤེགས་སོ།)†

ལྷམ་ལེ། རྩོད་ལུལ། ཁ་ནག། གཙང་དམར། སྤུ་དམར་ནང་། མེ་ཅུ། དར་  
 ཅེ་སོགས་ཀྱི་མི་སེར་གང་པོ་དང་། གཞན་ཡང་ལ་དྲགས་སྤྲོད་གཤམ་དང་། མངའ་  
 ཞབས་གང་ཡོད་ན་མཆོད་གཞིས། ས་སྤུ་དུ་བསྐལ་བ་ནས་གནས་ཀྱི་བར་དུ་ལུལ།  
 བྱུང་ཐོབ་ཆེན་པོ་སྤྲོ་ཆེ་རས་ཆེན་གྱིས་ཉེ་མི། ལྷེ་བདེ། ལྷམ་ལེ། བཀྲ་ཤིས་  
 སྒྲང་སོགས་ཀྱི་དགོན་པ་བཞེངས་ནས། གསེར་དབྱེལ་རྩངས་གསུམ་ལ་གྱི་བཅས་

\* This sentence seems incomplete.

† From B only, it is not free from Ladakh provincialisms, and probably somewhat defective.

‡ Sohl's edition gives the names of the monasteries: ཉེ་མི་=ཐུང་རྩལ་བམས་མིང་། ལྷེ་བདེ་=ལྷེ་མཆོམས། ལྷམ་ལེ་=བདེ་ཆེན།

སྐུ་དང་མཚོ་དེ་ནི་ (མང་པོ་བཞིངས།) དགོ་འདུན་གྱི་སྒྲེ་སོགས་གྱུ་ཆེར་མཛོད་  
 གྱུ་ལ་པོ་སོ་རྒྱུ་ཞེས་གྱུ་ལ་གྱིས། ཡབ་བདེ་གཤེགས་འཇམ་དབྱངས་ཞེས་གྱུ་ལ་གྱི་  
 དགོངས་རྒྱུ་ལ། བབ་སྒྲོར་གསེར་རངས་ཀྱི་གྱུ་ལ་བ་བྱས་པའི་སྐུ་ཐོག་སོ་  
 གསུམ་པ་ཅིག་བཞིངས་ནས། རིན་པོ་ཆེ་དང་། གཡུ། བྱི་བུ་འི་གྱུ་ཞེས་ཕྱུ་ལ་  
 དབྱས་སུ་བཅ་ཆེན་རིན་པོ་ཆེ་ལ། གསེར་དབྱལ་མང་པོ་དང་། ཟུ་དྲི་གྱི་སྐུ་ཞེས་  
 བགྱུ་ཅོ། བྱི་བུ་འི་སྒྲོང་ཅམ་བགྱུ་ཅོ། སྒྲོས་ཤེལ་ཀྱུ་ལ་ཅམ་བགྱུ་ཅོ་བཅས་ཀྱི།  
 འབྲུལ་བ། གྱུ་བ་ཐོབ་ཆེན་སྐུ་ཆང་རས་ཆེན་མཚོ་གཏུ། 5་100། གཡལ་གཏུ་100་  
 གླང་100། ལུག་1000། 2་1000། དབྱལ་1000། གསེར་ལོ་100། འབྲུལ་ལ།  
 3000། ཟུ་དྲི་གྱི་སྐུ་དང་། བྱི་བུ་འི་སྐུ་དང་། གཡུ་འི་སྐུ་དང་། མེ་མདའ་24་  
 མདུང་24། 24་གྱི་24། ལྷ་བ་24། གོས་ཆེན་ལུག་24། རྒྱུ་ལ་ལྷ་བ་20།  
 མེན་ཁྲིང་ལྷ་བ་24། ལ་བདགས་ཨ་ཤེ་ལྷ་བ་24་བཅས་འབྲུལ་བ་བསམ་གྱིས་མི་  
 ལྷ་བ་པ་ཕྱུ་ལ། དེ་ནས་སྒྲེ་ཆེན་དཔལ་མཁར་དགུ་ཐོག་ལོང་གསུམ་ནང་བཞིངས་  
 བསྐྱབས་ནས། ནང་དེན་གསེར་དབྱལ་ལ་གྱུ་བཅས་མང་པོ། གསེར་དབྱལ་རངས་  
 གསུམ་གྱི་བཀའ་འབྲུང་དང་། གཞན་ཡང་སྒྲིགས་བམ་པོ་དེ་མང་པོ་བཞིངས།

## A.

## Translation.

This (Lde-pal-k'or-tsan's)<sup>1</sup> sons were: *Skid-lde-nyi-ma-gon* and *Ta-shis-tsegs-pal*<sup>2</sup>), these two. *Skid-lde-nyi-ma-gon*, when on his way to

<sup>1</sup> The Gyal-rabs-sal-wai-mo-long (Gyalr. s. m.) MS. in my possession further explains, that Lde-pal-k'or-tsan (Gyalr. s. m. Ie-pal<sup>o</sup>) was the son of Od-shung, the legitimate son of Lang-dar-ma. Od-shung's claim to the throne was contested by Yum-stan, the suppositious son of the 'great' queen (the first wife), Od-shung being the true son of the 'lesser' queen (second wife).

<sup>2</sup> *Skid-lde*<sup>o</sup> and *Ta-shis*<sup>o</sup>, the one the son of the 'great', the other of the 'lesser' wife of Lde-pal<sup>o</sup>, were both robbed of all their possessions in Tibet proper by Yum-stan, and fled to 'Nga-rigs' (i. e., Nga-ris-kor-sum). From *Skid-lde*<sup>o</sup> the kings of 'Nga-rigs' derive their pedigree; from *Ta-shis*<sup>o</sup>, the chiefs of Yar-lung (Gyalr.

Upper Nga-ris—Tibet proper being in a state of revolution<sup>5</sup>—and accompanied by a hundred horsemen under the leadership<sup>6</sup> of Bal-ma-zug-tsan, K'ong-mo-nyag-pa (and) K-ka-wadzra, these three, (happened to be in so straitened circumstances) that he had nothing to eat but eggs and fish. Now (his servants) brought him (this dish) covered with a napkin. From this it has come to be a custom with the kings of Tibet to use the (so-called) 'Giant's Napkin.'<sup>6</sup> Eventually he arrived at Ra-lai-gyud.<sup>6</sup> He built K'ar-mar<sup>6</sup> in the Horse-year,<sup>7</sup> Tse-sho-gya-ri<sup>8</sup> in the Sheep-year. He caused many villages and hamlets<sup>9</sup> to be built throughout the broad valleys of Dam and Lag.<sup>10</sup> Mar-yul<sup>11</sup> he left undisturbed.

s. m.).—The word Lde, in this and other names, Koeppen (II, 52) assumes to be identical with lte-wa, 'navel, umbilicus, centre.' I find, however, that wherever lte-wa has the meaning of 'navel' etc., it is never spelt lde, so that I feel inclined to search for another meaning of lde.

<sup>5</sup> Schl's ed. has: རྩོད་ལོན་གྱི་ A MS. རྩོད་ལོན་གྱི་ Gyalr. s. m. རོན་ལོན་གྱི་ A learned Lama, Ṭa-shis-stan-p'el († Dec. 1890), informed me that in his opinion རྩོན་ལོན་གྱི་ should be substituted. As to the meaning, there can be no doubt, that it is as given in the translation.

<sup>6</sup> གསལ་མཁའ་མཚན་གྱི་ལྷ་པ་བརྒྱ་ : 'one hundred horsemen, whereof the most prominent were the three etc.' Similar phrases occur frequently throughout these documents, also relating to weapons and turquois (p. 123), monasteries (Schl's ed., p. 30a), etc.

<sup>6</sup> With the Rájás of Ladakh it is still in use under the name of Sang-K'ebś (གསང་ཆེན་པོ་) 'cover of the hidden thing.'

<sup>6</sup> Said to be a Steppe-district inhabited by nomads, beyond Ru-t'og; near it the ruins of an old castle, called K'ar-mar, still exist.

<sup>7</sup> These definitions of years without the number of the cycle of 60 are quite useless. Relating to human beings, the name of the year, in which they were born, usually suffices to determine their age, as their appearance and features clearly enough indicate through how many cycles of twelve years they may have lived. But relating to cities etc., after the lapse of centuries, no such corroborative evidence usually is available, and hence the name of the year alone is no clue to their age.

<sup>8</sup> Not known.

<sup>9</sup> རྩོད་ཆུར་ Several of the places, designated by this term and mentioned here, still exist and may be inspected any day. It must be said that they are not 'towns,' but merely 'hamlets.'

<sup>10</sup> Not known. In the Upper Suttlej valley (map of Turkestan, 4 sheets, 1882) I find, however, the names Dam and Luk,—could they have any connection with the places referred to here?

<sup>11</sup> Mar-yul and Mang-yul, (according to Ṭa-shis-stan-p'el, derived from a word me-ru, meaning 'bare rocks') includes Upper and Lower Ladakh, Nub-ra (comp. page 122), Zanga-kar etc.



At that time, of Mar-yul Upper Ladakh<sup>13</sup> was held by the descendants of Ge-sar,<sup>13</sup> whilst Lower (Ladakh) was split up into various independent principalities.

At that time Ge-shes-tsan<sup>14</sup> (was sent) to Pu-rang, where he asked and obtained the hand of Do-za-k'or-skyong. He married her and she bore him three sons. He now built the palatial residence of Nyi-zungs<sup>15</sup>

<sup>13</sup> لداك the Persian transliteration of the word གཤམ་ is certainly not warranted by the pronunciation of the word in Ladakh itself, where everybody says 'La-da-q', but I am informed by the Rev. J. Wober of Pu in Kunawar, that in that district the terminal -མ་ is invariably pronounced like ཅ་ or *ch* in 'looh'; this may account for the transliteration in Persian. The boundary between Upper and Lower Ladakh is the plateau between Basgo and Saspol (Survey Map : Bazgo and Saspol).

<sup>13</sup> Ge-sar, the name of a fabulous king of Tibet, or more correctly of the 'Ling-' people (ལིང་), and champion of the Lamaistic faith. He is not in any way connected with the kings of Tibet properly so called, and in the annals of these kings, so far as they are contained in the Gyalr. s m, he is referred to only once, viz., as one of the suitors of Kong-go, the Chinese princess, who afterwards became the wife of Shong-tsan-gam-po (chap. 13: བོ་ཤུང་མ་གཤམ་གྱི་ཐུག་པོ་). His wars against the Iang, Hor and the Chinese form the subject of an elaborate epic, the epic of Tibet. The parts relating to the Iang- and Hor-wars are printed and published, but the story of the war against the Chinese, I am told, is kept secret, lest the Chinaman should be too much offended by its publication. The narrative itself is not in metre, but in prose, but there is only very little of it, as compared with the number of speeches, songs etc. which are in metre. The 'Iang-war' is in the K'ams dialect, and for this reason difficult to read to us in Ladakh. The 'Hor-war' is much easier. The epic is popular throughout Tibet, but people in Purig are said to know more of it than anyone else. In Ladakh the Blo-da (professional musicians) do much towards its preservation, by rehearsing portions of it on festive occasions, to which they are invited to provide the musical part of the entertainment. Consequently most of the people are familiar with the names of the chief heroes and the general drift of the story, and indeed, if interrogated regarding it, will grow quite enthusiastic in their praises of the same. The Mongol version of the story (Translation into German by I. J. Schmidt, 1839) is very different from the Tibetan version, inasmuch as it dwells mainly on the exploits of Ge-sar when a boy and young man. Still, it is possible, that the war against the Kháns of Shiraighol and the 'Hor-war' may be identical as to their subject-matter.—In a house at Leh, belonging to one of the old Ka-lon (State-minister) families, illustrations of the story of Ge-sar may still be seen painted on the wall all round one of the rooms.—My own small collection of Tibetan MSS. includes parts of the 'Iang-' and 'Hor-wars.'

<sup>14</sup> Translation doubtful. It depends upon the exact meaning of Ge-shes-tsan.

<sup>15</sup> Said to be in Pu-rang.

along with the city,<sup>16</sup> and then conquered Nga-ris-skor-sum<sup>17</sup> completely. He ruled in accordance with the Faith.

His three sons were: Lha-ch'en-pal-gyi-gon,<sup>18</sup> Ṭa-shis-gon, the second, Lde-tsub-gon, the youngest. He gave to each of these three sons a separate kingdom,<sup>19</sup> viz., to (I) PAL-GYI-GON: his dominions were Mar-yul, the inhabitants using black bows, in the east, Ru-t'og and the gold mine of Gog,<sup>20</sup> nearer this way Lde-ch'og-kar-po,<sup>21</sup> at the frontier Ra-wa-mar-po,<sup>22</sup> Wam-le<sup>23</sup> and to the top of the pass of the Yi-mig-rock;<sup>24</sup> to the west, the foot of the Kashmir pass<sup>25</sup> from the cavernous stone<sup>26</sup> upwards hither;<sup>27</sup> to the north,<sup>28</sup> to the gold mine of Gog: all the districts included (within these limits). To Ṭa-shis-gon, (his)

<sup>16</sup> ཐུག་ལ་ does not necessarily mean a large city, but rather a village connected with a royal palace (e. g., Ting-gang, now Ting-mo-gang, near Nyur-la, is called a ཐུག་ལ་ but is merely a village.)

<sup>17</sup> Nga-ris-kor-sum usually includes the districts of Ru-t'og, Gu-ge and Pu-rang only. Here, however, it seems to include all Ladakh, Zangs-kar etc. as well.

<sup>18</sup> Lha-ch'en is an epithet usually applied to the eldest son only, and may mean 'the heir-apparent'; it is not a component part of the name, as it may be omitted (see 3 lines further down). It dropped out of use from the time of Ts'o-wang-nam-gyal (XX). (Comp. Lha-gohig = 'princess.')

<sup>19</sup> All the three kings are included under the term (Gyalr. s. m.): རྩ་ལྔ་གསུམ་ 'the three Lords of the Uplands.'

<sup>20</sup> Gog, not known. East and North seem to be quarters of heaven not definitely fixed in Ladakh geography. Here, Gog may be east or north; at some other place Ngam-ring is said to be east or north of Ladakh. Now Ngam-ring is known to be a place on the road to Lhasa, 21 marches this side of this city, and hence cannot possibly be to the north, but is to the west of Ladakh. An explanation, how this confusion came about, I am at a loss to give.

<sup>21</sup> ལཱ་ཅོ་ཐུ་ said to be by Ṭa-shis-stan-p'el = མཱ་ཅོ་ཐུ་ 'of the district lower down.' Lde-ch'og-kar-po = Dem-ch'og of the maps (Turk.). Near the frontier and on the river Indus.

<sup>22</sup> Not known.

<sup>23</sup> Wam-le = Han-le, famous for its magnificent Lamasery (picture in Cunningham, Ladakh).

<sup>24</sup> = Imis-La (map of Turk.), at the foot of which the Han-le stream has its source.

<sup>25</sup> i. e., the Zoji-la or Zoji-bal.

<sup>26</sup> Not known.

<sup>27</sup> To Ladakh people: 'going in the direction of Lha-sa' is 'going up,' 'coming away from there' is equal to 'going down.' (Comp. the word גָּלוּ in Hebrew.) Hence མཱ་ཅོ་ཐུ་ always means, 'away from Lha-sa, down to here' = 'downwards hither,' ཡན་ཅན་ and ཐུན་ཅན་: 'going from Purig or any place west of Ladakh, Lha-sa direction, as far as Ladakh' = 'upwards hither.'

<sup>28</sup> See note 20.

second (son), he gave: Gu-ge, Pu-rang, Tse,<sup>89</sup> etc. To Lde-tsug-gon, (his) youngest (son), he gave: Zangs-kar-go-sum,<sup>90</sup> Spi-ti, Spi-lohogs,<sup>91</sup> etc.

Pal-gyi-gon, the eldest, had two sons: (II) DO-GON and Ch'os-gon.

The son of Do-gon was: (III) LHA-CH'EN-PAGS-PA-LDE.

His son was: (IV) LHA-CH'EN-JANG-CH'UB-SEM-PA.

His son was: (V) LHA-CH'EN-GYAL-PO. As to the reign of this king: he built the Lamasery of Lu-k'yil<sup>92</sup> and caused a brotherhood of Lamas<sup>93</sup> to settle down (there). He provided for a long time, with untiring (zeal), the recluses<sup>94</sup> that lived in the neighbourhood of the Kailása and the three lakes<sup>95</sup> with the necessities of life; when they were numerous (there were) about five hundred, when few, one hundred.

His son was: (VI) LHA-CH'EN-UT-PA-LA. As to the reign of this king: after having united the forces of Upper and Lower Ladakh he invaded Nyung-ti.<sup>96</sup> The king of Nung-ti bound himself by oath, so long as the glaciers of the Kailása will not melt away, or the Manasarovar lake<sup>97</sup> dry up, to pay tribute and dues<sup>98</sup> (to the king of Ladakh), (*viz.*) Dzo<sup>99</sup>

<sup>89</sup> Not known.

<sup>90</sup> Go-sum, '3 doors,' may refer to the 3 valleys that join at the central part of Zangs-kar.

<sup>91</sup> Spi-ti, well-known district within British territory. As to Spi-lohogs I would venture to suggest, that Lahoul may be meant by this term. This district would have well rounded off his dominions and would have been the connecting link between Zangs-kar and Spi-ti. B MS., however, relating to the present century, has གཤམ་གྱི་ Gar-zha, the usual Tibetan name for Lahoul.

<sup>92</sup> Schl.'s ed. and mlg: Li-kyir (Survey Map: Likir), a village on the upper road from Leh, or rather from Basgo, to Nyurla (Snurla) and Ka-la-tso (Khalsi). This name would suggest (as well as the name of Lama-yurru, Yurru being = Yung-dang = Svastika) that, as in Tibet so also in Ladakh, the Bon religion at one time was prevalent, of which the worship of the Lu (Nágas) and of the Yung-dang, and the idea of a Bon, i. e., *summum bonum*, seems to have formed the most important elements. (This is borne out by the contents of a volume on the Bon religion, which was recently placed at my disposal).-

<sup>93</sup> དཔལ་འབྱུང་གི་མེ་ — but དཔལ་མེ་ = Lamasery.

<sup>94</sup> ལྷ་པ་པ་མཛོད་པ་ 'those who exert themselves to obtain ལྷ་པ་པ་' (Arhatship).'

<sup>95</sup> The maps know of two lakes only. But there is a possibility that the Kailása counts as one and, with the 2 lakes, makes up 3 separate places.

<sup>96</sup> Nyung-ti = Kullu, Capital: Sultánpur.

<sup>97</sup> *Viz.*, the Ma-p'am lake, the more easterly one of the two.

<sup>98</sup> Tib. དུ་ in Jäschke's Dictionary, but the MSS. and Schl.'s ed. unanimously write ལུ་

<sup>99</sup> Well-known cross-breed between yak and cow.

and iron, etc. This treaty remained in force till this day.<sup>40</sup> He also subjected Lo-wo,<sup>41</sup> (and the country) from Pu-rang downwards hither; in the south the country of De-shang to the place, where the water is fiery;<sup>42</sup> to the west, from Ra-gan-deng-shing (and) Stag-k'u-ts'ur<sup>43</sup> upwards hither; to the north, from Ka-shus<sup>44</sup> upwards. (They all) paid an annual tribute and attended the Darbār.<sup>45</sup>

His son was: (VII) LHA-CH'EN-NAG-LUG. This king built the palace<sup>46</sup> at Wan-la,<sup>46</sup> in the Tiger-year, K'a-la-tse<sup>47</sup> in the Dragon-year.

His sons were: (VIII) LHA-CH'EN-GE-BHE and Ge-bum.

His son was: (IX) LHA-CH'EN-JO-LDOR.

His son: (X) TA-SHIS-GON.

[His son: Lha-gyal.]<sup>48</sup>

This king caused a copy to be written of the Gyud-do-rje-tse-mo,<sup>49</sup> and of the Ngan-song-jong wai-gyud<sup>50</sup> and of the Gyud-bum,<sup>51</sup> all in gold.

His son was: (XI) LHA-CH'EN-JO-PAL. This king performed royal,

<sup>40</sup> Some twenty years ago the tax-collector of the king of Ladakh, still used to visit Lahoul and probably Kullu, although the two districts then already were under British rule.

<sup>41</sup> Not known.

<sup>42</sup> Not known, although people pretend to know well that a lake exists, called by them T'so Padma-chan, to which the passage is said to refer. It is supposed to be in British territory. The Sham-bha-la-pai Lam-yig contains the following passage: 'At the city of the king Da-ya-tse of Pu-rang, in consequence of water striking against coal, at night the coal is seen burning. It is said of this coal and water, that they have the peculiarity that the water, if introduced into the stomach of man or beast, turns into stone.' What to make of this, I cannot divine, but it seems certain that the phenomenon referred to here is the same as that alluded to in the passage.

<sup>43</sup> Not known.

<sup>44</sup> Tib. རྒྱ་ཁྱེད་

<sup>45</sup> མཁའ་འགྲུ་ usually translated by 'palace'; I feel inclined to prefer 'fort' or 'castle.'

<sup>46</sup> One march off the Kashmir road, near Ka-la-tse and Lama-yurru. (Survey Map: Wanbah.)

<sup>47</sup> At the bridge crossing the Indus (Kashmir road). Map of Turkistan and Survey: Khalschi; Drew: Khalsi.

<sup>48</sup> Mentioned in Schl.'s ed. only. Doubtful.

<sup>49</sup> 'Treatise of the Vajra-point.'

<sup>50</sup> 'Treatise on the Romoyal of Going to Perdition.'

<sup>51</sup> '100,000—Treatise.' With the two first-mentioned treatises I am not acquainted. The Gyud-bum consists of 12 vols. (in the ordinary printed edition), but I have also seen very fine written volumes, one, e. g., on indigo-tinted paper with letters in gold. The contents seem to be disquisitions on the Mahāyāna philosophy.

as well as clerical duties (to such perfection) that he arrived at the end<sup>52</sup> (of his transmigrations).

His son was: (XII) LHA-CH'EN-NGOS-PUB. During the reign of this king the usage of novices going to Us-Tsang was first introduced. He also repaired the colleges that had been built by his ancestors; but more important than this: he laid down before the Prince of the Faith, the Lord of the three Worlds,<sup>53</sup> gold, silver, copper, coral-beads, pearls, etc., all (presents numbering) one hundred. He also caused to be copied<sup>54</sup> the Ka-gyur twice and the Sang-ngags-kyi-skyil-k'or<sup>55</sup> many times.

His son was: (XIII) LHA-CH'EN-GYAL-BU-RIN-CH'EN.

His son was: (XIV) LHA-CH'EN-SHES-RAB. As to the reign of this king: having built the hamlet Seng-ge-sgang on the top of the so-called Hang-tse-mo (-rock), he made it a dependency of the Chang castle of Sa-bu<sup>56</sup> in Mar-yul.

His son was: (XV) LHA-CH'EN-T'I-TSUG-LDE. This king built (one row of) ch'ortens (numbering) one hundred and eight<sup>57</sup> at Leh,<sup>58</sup> and two (rows of) 108 at Sa-bu.

His two sons were: (XVI) LHA-CH'EN-PAGS-BUM-LDE and Dags-pa-bum.

Dags-bum-lde held Leh etc. He erected, for the sake of his reputation with posterity,<sup>59</sup> the Red College<sup>60</sup> and a Buddha Maitreya, the

<sup>52</sup> I. e., 'as a transcendent virtue, Páramitá.' མཐའ་རྒྱུན་པ་ i. e., the ordinary སྐུ་རྒྱུན་པ་

<sup>53</sup> = Buddha, i. e., his image, probably the so-called Io-wo.

<sup>54</sup> བཞེང་བ་ most closely agrees with the German: 'stiften, stift, stiftung'; an exact equivalent in English I have not been able to discover.

<sup>55</sup> 'Wheel of Dhāraṇī' ('secret spells'), a kind of book of which there exists a great variety.

<sup>56</sup> Village six miles SE. of Leh, off the main valley. (Survey Map: Sobu.) The Hang-tse-mo is a rock well known there. The castle is in ruins.

<sup>57</sup> 108, བརྒྱ་མཉམ་ a sacred number. 108 is also the number of beads of the ordinary rosary of Lamaists, (for other examples see Sir Monier Williams' book on Buddhism, second edition, page 383). I find in G. H. Schubert's Sternkunde (1832) the observation, that in India 4,320 lunar years constituted one sacred period, the first of which terminated about the commencement of our era. It may be divided into 4 periods of 1080, equal to two Phoenix periods of 540 years. As 108 is a constituent of all these figures, it may be supposed to be in some way connected with them. The rows of ch'ortens referred to here usually consist of ch'ortens not higher than 2 or 3 feet, and resemble low walls built at random anywhere across the desert.

<sup>58</sup> སྐུ་ sometimes སྐུ་ I adopt the usual spelling of the 'Postal Guide.'

<sup>59</sup> རྒྱུ་མཉམ་རྒྱུ་མཉམ་ = 'for the sake of his reputation with posterity,' German: 'Nachruhm.'

<sup>60</sup> Probably the one on the Nam-gyal-tse-mo at Leh.

Lord, in size (such as he will be) in his eightieth year.<sup>61</sup> On his right and left there were a Mañjuśrī and a Vajrapāṇi, each one story high. He caused to be painted all fresco pictures, representations of the departed Buddhas, of the preserver of the universe,<sup>62</sup> and of all his own private deities. He also built a triple temple (one surmounting the other) on the pattern of (the one at) T'o-ling.<sup>63</sup> As a symbol of the Word,<sup>64</sup> he caused a copy to be written of the Zungs-bum-ch'en-mo<sup>65</sup> and of the Kon-ch'og-tsegs-pa lang-kar shegs-pa<sup>66</sup> and some others. As a symbol of the Spirit: some fatality having occurred at Leh, he built over the Teu<sup>67</sup> ser-po ('Yellow Crag') completely, outside in the shape of a ch'orten, inside containing 108 temple-shrines. The ch'orten is called: Teu Ṭa-shis-od.ṭ'o.<sup>68</sup> Again, in the lower part of the valley of Leh, there is a crag resembling an elephant. The king caused to settle down on this rock a brotherhood of four Lamas.<sup>69</sup> Having done all this, he said: 'If I die now, it matters not.'

<sup>61</sup> *I. e.*, in a sitting posture about 20 or 25 feet high.

<sup>62</sup> Tib. འཛིན་པོ་པ་པོ་པོ་པོ་པོ་པོ་ probably Maitreya (?).

<sup>63</sup> Tib. མཐོ་ལྷིང་ pronounced To'-lding, on the Upper Sutelj. (Map of Turkistan: Totilingmat, 'mat'='the lower' i. e. lower part of the city.' The Sham-bha-la-pai Lam-yig contains a reference to this temple: "it had been built (A. D. 954 Sohl.) by the Lo-tsa-wa Rin-zang-po. The Hor (Turks?) burnt it down, but at some later date it was rebuilt, and now, in its lowest compartment, it contains the 'Cycle of the Collection of Secrets'." Adolph von Schlagintweit visited it; see 'Results of a Scientific Mission.'

<sup>64</sup> ལྷ་མཚན་ལྷ་མཚན་ = 'body, word and spirit,' or in common parlance: ལྷ་མཚན་ལྷ་མཚན་ and mystically expressed by the formula ལྷ་མཚན་ལྷ་མཚན་, have each their own special རྟེན་ or symbols; ལྷ་མཚན་ལྷ་མཚན་ 'the image,' ལྷ་མཚན་ལྷ་མཚན་ 'the Scriptures'; ལྷ་མཚན་ལྷ་མཚན་ 'the Ch'orten.' They represent a kind of triad, corresponding to the 'three Holies,' རྟེན་ལྷ་མཚན་ལྷ་མཚན་ i. e., the Buddha, the Law and the Order of Monks, (comp. Sir Monier Williams, p. 175.) But there may be, just as རྟེན་ལྷ་མཚན་ལྷ་མཚན་ is not without some underlying idea of a Supreme Being, ruling over all, some other more obscure and deeper meaning embodied in these symbols.

<sup>65</sup> 'The great 100,000 of Dhāraṇī.'

<sup>66</sup> 'How the three Holies came to Ceylon'—'tsegs-pa' (པ་པོ་པོ་པོ་པོ་) i. e. probably ལྷ་མཚན་ལྷ་མཚན་ལྷ་མཚན་ 'threefold, triple, three one above the other.'

<sup>67</sup> Tibetan རྩ་ལྷ་ 'crag.'

<sup>68</sup> This ch'orten 'Brilliant good fortune,' still exists, though in a dilapidated condition, about two miles up the Leh valley from the British Joint-Commissioner's compound.

<sup>69</sup> Also still extant at the suburb of Leh called Ska-ra, near the Kil'a.

(At that time it came to pass that) the Omniscient of the period of degeneration, the great Tsong-k'a-pa, Lobzang Dags-pa,<sup>70</sup> having in his possession a T'se-pag-med<sup>71</sup> about as long as a finger joint, which had originated from the blood of his nose, entrusted the same to two ascetics, and said, 'Give it either to the one called Dags-pa or to the one called Lde.' When the two arrived in Mar-yul, the one called Dags-pa was in Nub-ra. They went into his presence, but he did not deign to look at them with so much as one eye. So they went on to Leh. On the morrow the king gave command: 'At to-day's Darbár, whosoever attends, be it ascetics, or Bhe-da,<sup>72</sup> or Mon,<sup>73</sup> or Ti-shi,<sup>74</sup> he should not be refused admittance.' Now when the two ascetics came into his presence, the king rose and went to meet the two ascetics. The two ascetics made over the present, and the king was delighted with it. Taking the precious law of Buddha for his pattern,<sup>75</sup> he built the Lamasery of Spe-t'ub,<sup>76</sup> though in reality he did not build it, but it came into existence by a miracle. Having built it, he caused many brotherhoods of Lamas to settle down (in the country).

His son was (XVII) Lo-pos-CH'OG-LDAN. As to the reign of this king: from Gu-ge were brought: 18 coats of mail,<sup>77</sup> the most excellent

<sup>70</sup> Lo-bzang (= pron. Lobzang) Dags-pa is Tsong-k'a-pa's spiritual name (comp. Koeppen II, p. 118).

<sup>71</sup> 'Time without measure,' 'Eternity,' an epithet of Gautama Buddha.

<sup>72</sup> Bhe-da: professional musicians of low caste, Muhammadans, of Balti extraction. They, as well as the other low caste inhabitants of Ladakh, now may possess fields and houses.

<sup>73</sup> Mon: joiners and carpenters by profession, also of low caste, though not quite so low as the Bhe-da. They probably are remnants of the tribes of aborigines, but at one time occupied the hill districts of the Himalayas. Though Buddhists, the zamíndárs keep apart from them, and any zamíndár who would marry a Mon-maiden would by doing so lose caste.

<sup>74</sup> Ti-shi: another low caste, shoemakers by profession. They also are Buddhists.

<sup>75</sup> This probably means: 'he adopted the reformed doctrines of Tsong-k'a-pa.' Tib. དཔ་ཅན་ Pf. དཔ་ཅན་ 'to imitate.'

<sup>76</sup> Lamasery and village, on the river Indus, five miles south-west of Leh. The Lamas belong to the Ge-ldan-pa order of Lamas. The Lamasery has an incarnated Lama (Sku-shog: སྐུ་མཆོག་ B MS.). It is vulgarly called Spi-t'ug (Survey Map: Pittuk). Other Lamaseries of the Ge-ldan-pa order in Ladakh are T'ik-se (Survey Map: Tikzay), Sang-kar (a Leh suburb), Li-kir, Ri-dzong and many small ones.

N B.—Although the 'Order' primarily refers to the Lamas, yet every family or house (ཁྲིའུ་པ་) in the country is affiliated since time immemorial to one or other of the Lamaseries, and hence is attached to the respective Order of Lamas as a kind of lay-dependency, and worships the same tutelary deity (ཁྲི་དམ་).

<sup>77</sup> Names given to weapons etc. are very common in Tibetan literature. They

of their number being the Mu-t'ab-zil-pa,<sup>78</sup> the Ma-moi-mun-Dib,<sup>79</sup> the T'ab-ch'ung-ka-ru<sup>80</sup> (and) the Lha-t'ab-kar-po;<sup>81</sup> 18 swords, amongst them being the Nam-k'a-t'ag-ldag,<sup>82</sup> the D'ong-tse-rings<sup>83</sup> (and) the Log-mar-me-sad;<sup>84</sup> 15 knives, whereof the best were: the Dud-di-nag-po<sup>85</sup> (and) the Dam-di-zlung-gyad;<sup>86</sup> 15 turquois, the best of these were: the Lha-yu-od-ldan<sup>87</sup> (and) the Lha-yu-kar-po;<sup>88</sup> 20 saddles, amongst them the Ga-ma-ji-t'i-stengs<sup>89</sup> (and) the Ta-shis-od-ldan.<sup>90</sup> (Also) ponies (*viz.*), 50 gray ones, 50 isabel, 20 black, 30 piebald; also 20 young yak-cows and twenty light-brown yak-bulls, besides sheep, etc.; in short (they brought) tribute, revenue and presents in vast quantities. Having conquered Nga-ris-skor-sum as well, (his dominions) grew much in extent.

Lha-ch'en-dags-pa-bum had ruled over Rab-stan-lha-tse,<sup>91</sup> Te-ya,<sup>92</sup> etc. He built the royal city of Ting-gang.<sup>93</sup>

His son was: Lha-ch'en-bha-ra.

His son was: (XVIII) LHA-CH'EN-BHA-GAN. This king was very fond of fighting. He and the Shel<sup>94</sup> people having formed an alliance, they depōsed and subjected the sons of the king of Leh, Dags-bum-lde, (*viz.*), Lo-dos-ch'og-ldan, D'ung-pa-a-li and Lab-stan-dár-gyas.

present a serious obstacle in reading, *e. g.*, the Ge-sar epic. Schl. also, in this passage, failed to recognize the fact that it chiefly consists of proper names. Coats of mail in Ladakh usually were either chain-armour or made of scales of metal. At P'i-yang (Survey Map: Phayang) Lamasery a collection of such armour is still shown to visitors.

<sup>78</sup> 'The resplendent Devil-Coat-of-mail.'

<sup>79</sup> 'Devil-Darkness.'

<sup>80</sup> 'The little Coat-of-mail Heavy-weight' (?).

<sup>81</sup> 'White Deva Coat-of-mail.'

<sup>82</sup> 'Licking blood off the sky.'

<sup>83</sup> 'Wild yak, long point.'

<sup>84</sup> 'Killer of the red Lightning-flame.'

<sup>85</sup> 'Black Devil-knife.'

<sup>86</sup> 'Knife of 5 marks (seals)' (?).

<sup>87</sup> 'Luminous Deva-Turquois.'

<sup>88</sup> 'White Deva-Turquois.'

<sup>89</sup> 'Raised Glory-throne Saddle' (?).

<sup>90</sup> 'Good Fortune, light emitting.'

<sup>91</sup> Proper name of the palace of Basgo (S. m. Bazgo), now in ruins.

<sup>92</sup> Near Nyur-la (S. m. Snurla), but off the main valley to the North. Survey Map: Jeah.

<sup>93</sup> Close to Je-ya; Survey Map: Jemesgam. It is, according to our ideas, a village. It is one of the prettiest villages in Ladakh.

<sup>94</sup> Vulg. She, Survey map: Shay; village ten miles SSE of Leh, on the right bank of the Indus. It has a palace of the Ladakh Rájá (comp. B MS.)



His sons were: Lha-ch'en-lha-wang-nam-gyal<sup>95</sup> and (XIX) TA-SHIS-NAM-GYAL, (these) two.

Lha-wang-nam-gyal had great bodily strength and was clever at (any kind of) sport.<sup>96</sup> But Ta-shis-nam-gyal, the younger (of the two), being very crafty, caused the prince's eyes to be plucked out. Still, lest the dynasty should die out, he gave him a wife and allowed him to stay at Ling-snyed.<sup>97</sup> His sons<sup>98</sup> were: Lha-ch'en-ts'e-wang-nam-gyal, Nam-gyal-gon-po, and Jam-yang-nam-gyal, (these) three were born. These three sons grew very tall in stature, they grew taller within a month, than what others grow in a year, and they grew taller within a day, than what others grow within a month.

At that time the king Ta-shis-nam-gyal reigned. This king conquered (all the country) from Pu-rig<sup>99</sup> upwards and from Do-shod<sup>100</sup> downwards hither. He brought (home) herds of ponies in inconceivable numbers. He built the fort on the Nam-gyal-tse-mo<sup>101</sup> of Leh and founded the hamlet of Ch'u-bhi.<sup>102</sup> He fought against an invading force of Turks, and killed many Turks. He erected a temple (dedicated) to the (four) Lords<sup>103</sup> on the Nam-gyal-tse-mo and laid the corpses of the Turks

<sup>95</sup> Nam-gyal, རྩོམ་ཐུག་ and རྩོམ་པར་ཐུག་པ་ 'the quite victorious' here occurs for the first time as part of a name of a member of the royal family. It seems to designate the new dynasty and remains in use to this day.

<sup>96</sup> Tibetan ལྷ་རྩལ་

<sup>97</sup> Ling-shed (Survey Map: Linshot) in Zangs-kar, four marches south of Kala-tse.

<sup>98</sup> The sons of Lha-wang-nam-gyal, that is, of Ta-shis-nam-gyal, had no children. They were brought to Leh, where they received their education (Ta-shis-shan-p'el).

<sup>99</sup> District crossed by the Kashmir road from the Zoji-lu to the Po-to-la. Capitals: Kargil (Thanadār) and Kartse. The inhabitants are partly Buddhists, partly Shiah Muhammadans. They are a race distinct from either Baltis and Ladakhis. They wear an upper garment of a dark-brown colour—by which they may be distinguished from Ladakhis—and a small round skull-cap. The long locks of hair on the temples, in fashion with Baltis, are not seen with Pu-rig men. They all but monopolize the carrying-trade between Ladakh and Kashmir, ponies—though not a very good breed—being their chief wealth.

<sup>100</sup> Name of a district about the 25th stage from here to Lhasa between Maryum La and Chachu Sangpo (Map of Turkistan).

<sup>101</sup> The 'Palace' occupies the very summit of the precipitous rock (Nam-gyal-tse-mo) at the foot of which the city of Leh is built. The 'Leh palace' is at a lower level. Now some religious buildings only remain, the fort itself being in ruins.

<sup>102</sup> Chu-bi: about a dozen of houses at the foot of the western declivity of the Nam-gyal-tse-mo. The road to the top passes through it. (Survey Map: Chubbee.)

<sup>103</sup> I. e., 'the four Great Kings (Māharājas),' the Guardians of Buddhism (comp. Sir Monier Williams, p. 206.) The temple and images still remain (information by Ta-shis-stan-p'el).—As to 'Turks': ལོ་རྩ་ in Central Tibet means 'Mongols,' in

under the feet of (the images of) the (four) Lords. Again, by building the temple to the (four) Lords he obtained power over the demon that turns back hostile armies.<sup>104</sup> He invited the veritable Buddha whose name was Ch'os-je Ldan-ma from Di-k'ung (Lamasery)<sup>105</sup>, and then built the Lamasery called Gang-ngon-ta-shis-ch'os-dzong.<sup>106</sup> He made the rule regarding the number of children that were to be sent by every village to become Lamas,<sup>107</sup> and introduced the doctrine of the Dug-yud.<sup>108</sup> At the spot, where the Lamasery is seen (for the first time),

Ladakh, Turks of Central Asia. I am informed, however, that here exists a people in Tibet itself, somewhere between Ladakh and Lhasa, and occupying a considerable tract of country, called by the same name.

<sup>104</sup> This sentence occurs in B MS. only, where there is ལྷི་མཁན་ i. e., ལྷི་མཁན་ (see Jäschke, Dict.). I am not quite confident as to the correctness of my translation here, but if མགོ་ལོ་ལྷ་མཁན་ means 'the hostile army,' and not the army of the country 'operating at the frontier' I think it could not be rendered differently.

<sup>105</sup> It gives its name to a special Order of Lamas of the 'red' persuasion. (Koepfen II, 78.—Schl.'s information—Buddhism in Tibet, p. 74,—as to this sect is incorrect.) The head of the lamasery of Di-k'ung is a Ch'os-je.

<sup>106</sup> Proper name of the lamasery at P'i-yang ('ཕྱི་པང་') eight miles west of Leh, vulgarly called Sgangan Gon-pa.

<sup>107</sup> Tib. བརྩོན་ལྷན་ 'tax of children to be made Lamas.'—Under the old régime every family of more than one or two male children, had to give up one, not the eldest however, to be made Lama. Now, of course, this tax is no longer compulsory, and hence the great falling off in the number of Lamas. The Lama-child བརྩོན་ཁྱུང་ Tsun-ch'ung stays at home until his 8th year, wearing the red garment and red or yellow cap from the first. Then he goes to a lamasery, or is apprenticed to a Lama, in order to receive his primary education, until he reaches his 14th or 15th year, being all this time called བརྩོན་ཁྱུང་ Tsun-ch'ung. Then he goes to Lhasa, where his studies get their finishing touch. After a sojourn there of one or two years or longer,—now under the name of དཔེ་རྒྱུ་ Ge-ts'ul—on passing an examination conducted by the Head Lama of the respective lamasery, he is baptized and thereby made a Ge-long (དཔེ་ལྷོང་) Then he usually returns to his own country in order to perform there the functions of a village priest or to enter one of the Lamaseries, where special duties await him.

N. B.—There is an error prevalent regarding the dress of Lamas, which is propagated even by Sir Monier Williams in his recent book on Buddhism, viz., that the dress of Lamas of the 'red' persuasion is red, that of the 'yellow' persuasion, yellow. This is not so. The dress of both the 'red' and 'yellow' Lamas is red (with the exception of one special order of Lamas belonging to the Ge-ldan-pa, who, to my knowledge, only exist in Zanga-kar, whose dress also is yellow); but Lamas of the 'red' persuasion also wear caps and scarfs round their waist red, whilst in case of the 'yellow' Lamas these and those only are yellow.

<sup>108</sup> 'Treatise on Esoteric Doctrine.'

he suspended a long prayer-flag. Whosoever, whether thief or liar, in short, any one guilty of offence against the king's palace or life,<sup>109</sup> if he escaped to this spot, should be rid of his crime. Again, he presented to the Di-k'ung, Sa-skyā,<sup>110</sup> Ge-ldan, Lha-sa (and) Sam-yas<sup>111</sup> (lamaseries) cushions, gold-water, long prayer-flags, (tea for) tea generals,<sup>112</sup> (all) an hundred-wise, etc. He also caused a Ka-gyur and Stan-gyur to be copied besides many other (religious) books and erected many ch'ortens.

(He was succeeded by) the incarnate<sup>113</sup> king (XX), T'SE-WANG-NAM-GYAL (who) was invited to assume the royal functions. He, when quite a young man yet, already went to war. He conquered (all the country) from Ngam-ring<sup>114</sup> in the east downwards hither, (*viz.*,) Lo-wo, Pu-rang, Gu-ge, etc.; to the south (his conquests were) Dzum-lang<sup>115</sup> and Nyung-ti;<sup>116</sup> in the west (they included) Shi-kar<sup>117</sup> and K'a-(s)kar<sup>118</sup>. He also said, he would make war against the Turks north (of Ladakh), but the people of Nub-ra<sup>119</sup> petitioned him and he desisted. He brought the

<sup>109</sup> *I. e.*, *crimen læsæ majestatis*, though in a wider sense than usually accepted.

<sup>110</sup> Sa-skyā, lamasery of 'red' Lamas. (Sir Monier Williams, p. 448.) It gives its name to the Sa-skyā-pa Order. This Order is represented in Ladakh by the Masho Lamasery (South of the Indus, near He-mi).

<sup>111</sup> Ge-ldan, Lha-sa and Sam-yas are lamaseries at or near Lhasa, belonging to the 'yellow' persuasion. As to Ge-ldan or Ga-ldan see Sir Monier Williams, l. c., p. 441.—Lha-sa = La-dang (ལ་དང་) + Te-wa-shung (ཐེ་བ་ཤུང་ or བདེ་བ་ཤུང་) + Jo-k'ang (ཇོ་ཁང་ = house of the Jo-wo). See Sir Monier Williams, l. c., p. 440.—Sam-yas: *id.*, p. 448.

<sup>112</sup> Gold-water,—*i. e.*, gold finely divided by prolonged trituration, suspended in water, extensively used for gold-washing the images. 'Tea gonorals,' see *id.*, p. 330.

<sup>113</sup> He is supposed to have been an incarnation of Ch'ag-na-do-ye (Vajra-pāṇi).

<sup>114</sup> Ngam-ring: on the road from Lhasa to Ladakh, 21 marches this side of Lhasa. It is likely, that the three districts Lo-wo, Pu-rang and Gu-ge here are enumerated in succession, as they follow each other from east to west. Hence it would appear, that Lo-wo is the most easterly part of Nga-ris-skor-sum.

<sup>115</sup> Dzum-lang, not known. May be identical with Jumla (Map of Turkistan) in Nepal.

<sup>116</sup> Comp. note 36.

<sup>117</sup> = Shi-gar, large village in Baltistán. (See Drew, Northern Barrier, p. 210).

<sup>118</sup> K'a-(s)kar (Tib. ཀ་ར་སྐར་ — ར་ preceding ཀ་ in Ladakh is frequently pronounced like s) may be Skardo. There certainly is a Kashkar (Chitral) further west, but it is very improbable, that the Ladakh empire ever should have extended so far.

<sup>119</sup> Trade with Chinese Turkistán is almost essential to the welfare of Nub-ra. It is in Nub-ra, that all the caravans going to, or coming from, Yarkand obtain their supplies for man and beast. Consequently most grown-up people in Nub-ra know the Turkí language fairly well.

rulers of all these (districts with him) as hostages<sup>120</sup> and placed his own representatives into (their) castles. All Mar-yul grew much in extent. Gu-ge had to pay as tribute and dues annually 300 zho<sup>121</sup> of gold, Ru-t'og 260 zho of gold in addition to 100 three years' sheep, one riding-horse, 10 tanned skin-bags, and (the proceeds from the royal domains) of K'ar-o-ldong and Zhing-dar-ch'en-dar-ch'ung,<sup>122</sup> (indeed) from all sides they brought in tribute and dues in inconceivable quantities.

The king then came to consider: 'My ancestors have, on the pattern of the T'o-lings of Lha-sa and Gu-ge, placed the bones of the Buddha-Elephant<sup>123</sup> on the Tse-mo,<sup>124</sup> but as the people do not go there on pilgrimage, or in order to worship, or to offer up sacrifices, or perform circumambulations, I will, instead, build a college and (in fact) establish the doctrine of Buddha on a basis similar to what it was under my ancestor Ral-pa-chan.<sup>125</sup> But as his work on earth<sup>126</sup> was finished, he died.

Upon this all the vassal-princes lifted up their heads. (XXI) JAM-YANG-NAM-GYAL reigned. As to the reign of this king: two chiefs in Pu-rig did not agree. He came with the Ladakh army to the assistance of one of them, called Ts'e-ring-ma-lig. But the time had now come, when the period of darkness should supervene, the period when royal supremacy should well nigh be destroyed. The army of 'Alī Mir, captain of the forces of Nang-gong<sup>127</sup>, broke forth. They met, and by dint of

<sup>120</sup> ཅུ་ཤི་པ་ (Jüschke, Dict.); the MSS., however, are unanimous in writing རྩི་པ་; pronunciation also: Ste-pa.

<sup>121</sup> 1 zho of gold is stated to weigh  $\frac{1}{4}$  tolah, equivalent to almost 3 grammes. Its value in silver is said to correspond to about 15 to 18 Rupees. This would agree with the British guinea.—1 zho of gold is a price charged, *e. g.*, for large printed volumes like the Do-mang, which may be had at Loh Lamasery, printed to order for this price.

<sup>122</sup> K'ar-o-ldong and Zhing-dar-ch'en-dar-ch'ung are said to be the names of two estates near Ru-t'og (?).

<sup>123</sup> Gautama Buddha in one of his births figures as an elephant. His bones are supposed to be the relics referred to in this passage. They were destroyed by the Baltis at the time of Jam-yang-n-gy. (Communication by Ta-shis-stan-p'el.)

<sup>124</sup> Nam-gyal-tse-mo, compare notes 100 and 101.

<sup>125</sup> Name of one of the ancient kings of Tibet. His proper name was: T'i-lde-shong-tsan. His obsequiousness to the clergy rendered him odious to the people and noblemen, and prepared the way for Lang-dar-ma, the apostate and suppressor of Buddhism. He was murdered about 840 A. D., (compare Koeppen II. 72. The Gyalr. s. m., in the last chapter of the book, contains a very full account of the story. Compare also Schl.'s ed., page 206 and his translation, page 57.)

<sup>126</sup> ལྔ་མཁའ་ཐུག་ཕྱིན་པ་ It would seem far-fetched to explain this by: 'the work (karma) of a prior existence in their effects being exhausted' as suggested by Schl.

<sup>127</sup> Nang-gong = 'central and upper i. e. districts' vis., of Baltistán. O MS. replaces this term by 'Skardo.'

strategem, (ever) putting off (fighting) from one day to the next,<sup>128</sup> (he succeeded in holding them on), until all the passes and valleys were blocked with snow, and the king with his army, wherever they went, were compelled to surrender.<sup>129</sup> All Ladakh was (soon) overrun by Baltis, who burnt all the religious books with fire, threw others into the water, destroyed all the colleges, whereupon they again returned to their own country.

After this (it pleased) 'Alí Mír Sher Khán to give his daughter, Gyal-k'a-t'un<sup>130</sup> by name, who was an incarnation of the white Dol-ma,<sup>131</sup> to Jam-yang-nam-gyal to be his wife. After he had sojourned there for a little while, (it happened, that) 'Alí Mír (had a dream. He) dreamt he saw emerging from the river below his castle a lion, which jumped<sup>132</sup> and disappeared into (the body of) Gyal-k'a-t'un. It was at the identical time, that Gyal-k'a-t'un conceived. Now after 'Alí Mír had prepared a feast for all the soldiers, and Gyal-k'a-t'un had put on all her jewels, he invited Jam-yang-nam-gyal to mount the throne and then said: 'Yesterday I dreamt I saw a lion (emerging) from the river in front (of the palace) and jumping at Gyal-k'a-t'un, he disappeared into her body. At the very same time also Gyal-k'a-t'un conceived. Now it is certain, she will give birth to a male child, whose name ye shall call Senge-nam-gyal.' Having said this, he gave (the king) leave with the army of Ladakh to return home and to resume his royal functions.

She bore him two sons: Senge-nam-gyal and Nor-bu-nam-gyal, (these) two.

At that time Jam-yang-nam-gyal bethought himself: 'In the first instance, I went with my army to the assistance of T'se-ring-ma-lig of Pu-rig; the consequence was, that all Ladakh was laid waste. Now I will employ any means that may serve towards the propagation of the religion of Buddha, and make it spread. But as the religion of Buddha for its propagation is entirely dependent upon the people, I will, on my part, relieve them from all taxation, and treat them like my own children.' (Having thus resolved,) he equalized rich and poor three times

<sup>128</sup> Tib. འདྲི་མི་འཁྱོལ་ 'what day do you think, (we shall fight)?' འཁྱོལ་ 'it is likely' (Jäschke, Dict.).

<sup>129</sup> Tib. ཡུལ་ 'succumbed, lost, waned.'

<sup>130</sup> ལྷ་མེད་ according to Schlagintweit, a Tatar word, meaning 'Lady of noble birth.' (See his translation, p. 75, note 1)

<sup>131</sup> For Dol-ma kar-mo, ལྷ་མེད་མ་དུ་མཁྱེན་པོ་ mong-Tsaghan Dára-Eke, see Koeppen II, 65.

<sup>132</sup> Tib. བརྒྱལ་ 'a leap, bound.'

This king united under his sway (all the country) from Pu-rig upwards, and from Pang-tse<sup>133</sup> downwards hither.

Ts'e-ring-gyal-mo, the daughter of Jig-sten-wang-ch'ug, whom he had married before he took Gyal-k'a-t'un,<sup>134</sup> also bore him two sons: Ngag-wang-nam-gyal and Stan-dzin-nam-gyal. These two sons were sent to Us-tsang in order to (lay down) before the precious Jo-wo:<sup>135</sup> gold-water and cushions; at Das-spungs<sup>136</sup> (and) Ra-lung:<sup>137</sup> gold, silver, pearls, coral-beads, amber, trident-banners,<sup>138</sup> (tea for) tea generals, all numbering one hundred; at De-nam:<sup>139</sup> long prayer-flags,—and (to act) as messengers to the Dug-pa Incarnation,<sup>140</sup> whom they were to invite (to Ladakh).

For the sake of his reputation with posterity,<sup>141</sup> he caused a copy of

<sup>133</sup> Pang-tse (Survey Map: Jankse), well-known village, east of Leh, on the road to the Pang-kong lake and Jang-ch'en-mo. The limits given here include less territory than there had been under the kings of Ladakh at any other time.

<sup>134</sup> Although polygamy is not common with Ladakhis,—polyandry being more in vogue—yet no one objects, if a man, in case his first wife has no children, takes a second wife. The first wife is then called 'chan-ch'en,' the second wife 'chan-ch'ung;' chan ma is said to mean: 'a woman who prepares the food;' the spelling of the word is uncertain.

<sup>135</sup> Jo-wo: I am informed, there are really three images called by this name, two of them, the best known of all, are the Jo-wo Rin-po-ch'e and Jo-wo mi-skyod-do-rje, both in the Jo-k'ang at Lhasa, one on a lower, the other on an upper platform; the third, Jo-wo Shákya-mu-ne is the one at Ra-mo-ch'e. The Jo-wo mi-skyod-do-rje was brought by the queen Tí'-btsun (ཐི་བཙུན་) from Nepal (s. Gyalr. s. m., chapter 12), the Jo-wo Shákya-mu-ne, on the other hand, by the queen Kong-jo (ཀོང་ཇོ་ which has nothing to do with Kon-ch'og) from China (s. Gyalr. s. m., chapter 13). Where the Jo-wo rin-po-ch'e has come from, I do not know.

<sup>136</sup> A Go-ldan-pa-lamasery (see Sir Monier Williams, l. c., p. 442).

<sup>137</sup> Also written ལྷ་ཡུང་ and once འབྲུག་ཡུང་ an important Lamasery of the Dug-pa Order, near Lhasa.

<sup>138</sup> A long tuft of silk threads, suspended from a trident (K'a-tam-k'a or t'so-sum) and supported on a pole. It may be carried about or placed on the roof of Lamaseries and palaces. Its Tibetan name is ཇམ་དར་ not ཇོ་དར་ (Chab-dar, not Chob-dar).

<sup>139</sup> Lamasery (Ge-ldan-pa), two or three days' journey west of Lhasa.

<sup>140</sup> Probably an incarnation of Pal-je-shos-gon-po (པལ་ཇེ་ཤོས་གོང་པོ་) the tutelary deity (ཡི་དམ་) of the Dug-pas.

<sup>141</sup> Tib. ཐུ་མའ་ = ཐུ་མ་རྒྱལ་ཆེན་གྱི་

the Gya-tog-ser-sum<sup>143</sup> and of the Kar-gyud-ser-t'eng<sup>143</sup>, in addition (to other books), to be written in gold, silver, and copper. (Likewise) for the sake of posthumous fame, he would have very much liked to rebuild and present anew<sup>144</sup> whatsoever had been destroyed by the Baltis, but his life being short, he died (before he had been able to accomplish his purpose).

His son was the king of the Faith (XXII) SENGE-NAM-GYAL.

From his childhood he was very strong and clever at wrestling, running, jumping, shooting with (bow and) arrow as well as matchlock,<sup>145</sup> and riding. In any kind of sport he was to be compared with Siddhartha the son of Suddhodana of olden time.

The king, when yet a youth, made war against the back-steppes of Gu-ge. He carried away ponies, yaks, goats and sheep even so far as from the northern slopes of the Kailása, and (indeed) from everywhere on earth. Some time later he made war against the central provinces of Gu-ge also. Sha-wang and Zha-ye he allowed to be killed,<sup>146</sup> and he made all Ladakh to be full of yaks and sheep. He married the Ru-shod princess<sup>147</sup> Skal-zang-gyal-mo. He invited the king of Saints,<sup>148</sup>

148 ཐུ་ཏེ་ཐ་སེ་འཇུག་ is a religious 'Trilogy' consisting of the ཐུ་ཏེ་ཐ་ the ཏེ་ཐ་ཐུངས་, and the ཐ་སེ་འཇུག་. Frequently the last-named title is applied to the whole, viz., Ser-od. (See Jäschke's Dict., 'S. O.')

The Tog-zungs is in my possession but as yet remains unexamined.—Although 'Trilogy' is a term applied to dramatic productions only, yet considering that tripartite religious books are frequently met with in Tibetan literature, I think the term may be found useful.

143 Ta-shis-stan-p'el,—late Head-Lama of Stag-na Lamastery in Ladakh, and probably the most learned Lama in the country—informed me, that this is a kind of clerical genealogy, or a list containing the names of the chief Lamas of his own order, the Kar-gyud-pa, from its very commencement. The Kar-gyud-pa, who are supposed to derive their name from this genealogy (Kar-gyud, ཀར་གཡུད་) are a subdivision of the Dug-pa order.

<sup>141</sup> Tib. མཛུ་བཞེད་པ་ for 'rebuild and present anew.'

145 Tib. རྩེ་ལྔ་ (i. e., རྩེ་ལྔ་ reading) = firearms.

<sup>146</sup> As to Sha-wang and Zha-ye no information was available. Ta-shis-stan-p'el, however, was confident, that མར་རྒྱུ་གཤེད་བྱ་ means 'to kill.'

147 Ru-shod, རུ་ཤོད་ an upland district (about 15,000 elevation) between Ladakh and Lahoul and Spiti, usually called Rupshu (Drew) or Rukshu (Survey Map). The present 'queen' of Ladakh is also a Rupshu- 'princess.'

149 **सुय-देव** 'Sidha,' according to Sir Monier Williams (p. 536) seems to denote the degree next to, and below Arhatship. This passage, however, properly refers to Jainism. The word occurs again in the text 4 lines further down, where the eighty

called Stag-ts'ang-ras-ch'en (to Ladakh). This Buddha,<sup>149</sup> who had obtained the rainbow-body,<sup>150</sup> had visited Hindústán, Orgyan,<sup>151</sup> Kashmír, etc., and had seen all the eighty saints<sup>152</sup> face to face. In memory<sup>153</sup> of his father, he erected at Bab-go<sup>154</sup> an (image of) Maitreya, made of copper

ཐུབ་ཐོབ་ (Dab-t'ob) are mentioned. The only 'eighty' referred to anywhere in Buddhistic literature, are, I believe, the eighty 'Great Disciples, Mahásrávakas' (M. W.) They, indeed, were not supposed to have attained to Arhatship during life, but became Arhats at the moment of their death. Hence the ཐུབ་ཐོབ་ or Siddha would seem to be a 'candidate for Arhatship,' one who 'will obtain ཐུབ་པ་ i. e., perfection' when he dies. Two characteristics of the Dab-t'ob, incidentally mentioned here, also prove that between him and an Arhat-designate is very little difference. The first is, that he is able to have intercourse with the eighty 'Great Disciples,' i. e., that 'time' to him is of no account. The second is: that he had obtained the 'Rainbow-Body,' རཐོག་ལུས་ i. e., 'a body, which (at death) vanishes out of sight, not leaving any trace behind, just like the rainbow.' Compare the Ladakh-Gyalrabs (MS. in my possession, p. 67, and Schl's. 'Könige von Tibet', Tib. text, p. 14a) where there occurs a passage referring to the death of the seven བློ་ (T'i = 'throne') kings of Tibet: 'they died ལྷ་ལུས་རྩི་མེད་རཐོག་ལུས་ཡིན་པ་—Schl. ལུས་ is an error in writing—and their Dova-body disappeared like the rainbow, leaving no trace behind.' This, of course, amounts to obtaining Parinirvāṇa. Now as according to Sir Monier Williams the third and highest degree of Arhatship is identical with Supreme Buddhahood, it is no longer difficult to understand, how the two characteristics referred to apply to the ཐུབ་ཐོབ་ nor why Stag-ts'ang should be styled in the same passage a ལྷ་ལུས་ཐུབ་ i. e., a Buddha.—Stag-ts'ang is said to be the author of the small book of travel, the ཤམ་བུ་ལ་བཟོ་ལམ་ཡིན་ 'Sham-bha-la-pai Lam-yig,' referred to once or twice in these notes.

<sup>149</sup> Tib. ལྷ་ལུས་ཐུབ་ Comp. in German the words: 'der Verklärte, Verklärung.

<sup>150</sup> See note 148.

<sup>151</sup> Sometimes Urgyan = Udyāna.

<sup>152</sup> See 148.

<sup>153</sup> Tib. དཔེ་མཚན་ལྟར་ལྟར་ really has a much more profound meaning than simply 'in memory.' I think, its primary meaning is: 'to complete, what may be supposed to have been the intention of the deceased person to do, but was left undone'; a secondary meaning would be: 'to perform meritorious works on behalf of the deceased person, so as to benefit him or her in the Bar-do purgatory,' and thirdly (once in O MS., distinctly so): 'funeral rites and prayers read for the benefit of the soul.'—(The litany used on such occasions is called, in the case of the Ge-Idan-pa, རྩོད་ལམ་ 'the way of removing obstacles, viz, in the road to a happy rebirth,' and is usually read for 49 days, (as Sir Monier Williams gives it).

<sup>154</sup> Village on the river Indus, about fifteen miles west of Leh. (Survey Maps Bazgo.) The temple and image still remain, whilst the palace is in ruins. The place is well worth a visit.



and gilt, in size (such as he will be) in his eightieth year, and adorned with all kinds of precious stones. He introduced the great deities<sup>155</sup> of all Hindústán, east and west, and caused a copy of the Jams-ch'os,<sup>156</sup> five divisions and five volumes, to be written. He appointed for the duration of the (present) Skal-pa five Lamas to be in perpetual attendance and to offer up sacrifices and keep the sacred lamps burning both day and night. He put up sashes made of the most wonderful Chinese silks, (and also) umbrellas,<sup>157</sup> long prayer-flags, etc.

Again, in memory<sup>158</sup> of his mother, he sent to be laid down at the feet of the incarnation of P'ags-pa Rab-jor,<sup>159</sup> the Pañ-ch'en,<sup>160</sup> the Banner (lit. umbrella) of the Faith: golden earrings,<sup>161</sup> silver earrings, amber (pieces of) the size of apples 108,<sup>162</sup> smaller ones 108, coral-beads of the size of fowl's eggs 108, pearls of the size of Chinese peas 108 and smaller ones a great many. At ...<sup>163</sup> Lha-sa,<sup>164</sup> Ta-t'ug<sup>165</sup> and Sam-yas he offered up sacrifices, everywhere one thousand. To the Ge(-ldan), Das(-spungs), Se-ra, Dug-Ra-lung, Sa-skya and all the other Lamaseries, both great and small, he made presents of (tea for) tea generals and other things, all numbering one hundred, in plenty.

To the Saint stag-ts'ang-ras-ch'en, the same (as mentioned above),

<sup>155</sup> Tib. རྩ་ལྔ་ I follow, in my translation, Ta-shis-stan-p'el's explanation, but still some misgivings as to its accuracy remain.

<sup>156</sup> = 'Maitreya religion.' I have not been able to obtain information regarding it.

<sup>157</sup> Tib. རྩ་མཚན་ a crinoline-shaped kind of thing, but cylindrical, not conical, in form, about 8 feet in height by 1 foot in width; it consists of 2 or 3 hoops with a covering of black woollen threads or of trimmings of calico. It is planted on the roofs of lamaseries and palaces. Jäschke (Diet. 'trophy,') apparently did not recognize the umbrella.

<sup>158</sup> See note 153.

<sup>159</sup> Subhúti.

<sup>160</sup> The Pañ-ch'en rin-po-ch'e at Ta-shis-lhun-po. He is not usually supposed to be an incarnation of Subhúti, but as he may be an incarnation of Amitábha, of Mañjuśrí, of Vajra-páni and of Tsong-k'a-pa, there is no reason why he should not be an incarnation of Subhúti as well. (Comp. Koeppen II, 127.—For Subhúti: Koeppen I, 104, 600 and the recent publication of the Asiatic Society of Bengal: the 'Sher-Phyin.'—)

<sup>161</sup> Tib. འུ་མ་རྩ་ large earrings of silver or gold, consisting of a ring about two inches in diameter, on to which are strung, like beads, a large number of very diminutive rings of silver or gold.

<sup>162</sup> Comp. note 57.

<sup>163</sup> Possibly one name wanting.

<sup>164</sup> Comp. note 111.

<sup>165</sup> Lamasery at Lha-sa (Ge-lidan-pa).

he gave, in the several districts that belonged to himself, estates<sup>166</sup> as well as sites for religious buildings,<sup>167</sup> and Stag-ts'ang-ras-ch'en, during the reigns of both the father Senge-nam-gyal and the son De-ldan nam-gyal, the father then being in his decline and the son in his prime of life,<sup>168</sup> satisfactorily completed the Lamaseries at Wamle, Ṭa-shis-gang,<sup>169</sup> He-mi,<sup>170</sup> T'eg-ch'og,<sup>171</sup> etc. Thus the Law of Buddha made good progress. He governed over all his dominions according to the rule of the ten virtues,<sup>172</sup> and thus (it came to pass) concerning the kingdom of this world, that the king was like the lion and the Lama like the tiger,<sup>173</sup> and their (united) fame encompassed the face of the earth as 'the lord and the Lama,<sup>174</sup> sun and moon, a pair.'

After this, Senge-nam-gyal bethought himself: '(My) uncle Ts'e-wang-nam-gyal (certainly) did rule (over all the country) as far as Ngam-rings in the east (north), but he did not live long, and during the reign of (my) father Jam-yang-nam-gyal all the vassal-princes again rose (and made themselves independent).'<sup>175</sup> So he again went to

<sup>166</sup> Tib. ལ་ཡུན་ 'a first offering, earnest of land.'

<sup>167</sup> Tib. མཆོད་གཞི་ལ་ 'offering site.'

<sup>168</sup> Tib. རྩོད་ལོ་ 'decline of life,' རྩོད་ལོ་ 'primo of life.' This remark shows, —supposing General A. Cunningham's dates to be correct,—that Schlagintweit's first calculation (in 'Buddhism in Tibet,' 1863) has probably more to commend it, than the second one in 'Könige von Tibet,' 1866.—In the former work he finds the dates 1644 as the date of the foundation of the He-mi lamasery, 1672 as the date of the completion. In the latter, on the other hand, he gives 1604 as the date of the foundation (under Jam-yang-nam-gyal), completion at 1644.—*Prima facie*, it seems very improbable that Jam-yang-nam-gyal should have ventured upon building enterprises on such a large scale, after the country had just recently been devastated by a ruthless foe.

<sup>169</sup> In Tibet about two marches from the frontier, on the river Indus. Map of Turkistan: Tashigong.

<sup>170</sup> Famous lamasery in Ladakh (Survey Map: Himis), about 18 miles SSE of Leh. The 'Himis-fair' in summer is the chief attraction to sight-seers in Ladakh. This lamasery is at present still the greatest land-owner in Ladakh, and its steward one of the most influential persons in the country. The Lamas are of the Dng-po order of the 'red' persuasion.

<sup>171</sup> Sister-lamasery to He-mi, north of the Indus, in a valley which opens out opposite Hemi. Che-de, vulg. Chem-ro (Survey Map: Chim-ray) is the name of the village, to which the lamasery belongs.

<sup>172</sup> See Sir Monier Williams, l. c., p. 128.

<sup>173</sup> Allusion to their proper names: Senge = lion, Stag = tiger.

<sup>174</sup> Tib. མཆོད་པོ་ཞེ་ — མཆོད་ = Lama. པོ་ཞེ་ 'dispenser of alms' (Jäschke, Dñt.) i. e., = Anglo-Saxon: hláford = Lord.

<sup>175</sup> The Tibetan text of this passage is not very clear.

war (and came) as far as Ngam-rings.<sup>176</sup> At Shi-ri-kar-mo<sup>177</sup> (his army) was routed. Upon this, there arrived an ambassador from Tibet, and (it was agreed that) the frontier should remain as before, and that his dominions should include all the country up to Us-tsang. On his return journey he died at Wam-lé.

Additions from C MS.

At Wam-le, God-yul, K'a-nag, Tsang-mar, Skyu-mar-nang, Me-ru, Dar-tse<sup>179</sup> the people, and elsewhere in Upper and Lower Ladakh throughout his dominions he (himself) gave to him for the duration of the present skalpa, sites for religious purposes and estates. The great saint Stag-ts'ang-ras-ch'en built not only the He-mi<sup>179</sup> (Jang-ch'ub-sam-ling<sup>180</sup>), Che-de (T'eg-ch'og<sup>181</sup>), Wam-le (De-ch'en<sup>180</sup>), Ta-shis-gang and other Lamaseries, but also raised images and ch'ortens of gold, silver and copper. He made the clergy very great.

In memory of his late father Jam-yang-nam-gyal, the king Sengenam-gyal erected at Bab-go an image of the Buddha Maitreya, made of copper and gilt, three stories high, and adorned it with precious stones, turquois, coral beads, etc. To the Pañ-ch'en-rin-po-ch'e in Us (-Tsang) he sent a present of gold and silver a large quantity, and pearls of the size of Chinese peas 108, coral-beads of the size of fowl's eggs 108, amber, pieces of the size of apples 108, and other things.

To the great saint, Stag-ts'ang-ras-ch'en, the Supreme, he presented 100 ponies, 100 yaks, 100 cattle, 1,000 sheep, 1,000 goats, 1,000 (Ladakh) Rupees,<sup>181</sup> 100 zho gold, 3,000 loads of grain, one string of pearls, one string of coral beads, one string of turquois, 25 matchlocks,

<sup>176</sup> Comp. note 114. It is probably the རྩ་ཁོ་ has come to be a component part of the name, hence: lang-ngam°.

<sup>177</sup> Name of a small lamasery on a rock on the right bank of the river Charta Sangpo (map of Turkistán) 29° 30' N., 84° 50' E. of Greenwich. The difficulty of crossing the river may to some extent account for the defeat of the Ladakh army. (Comp. Koeppen II, 146 and note 1.)

<sup>178</sup> Of these names God-yul is the name of the Han-le district. K'a-nag (Drew's map: Kharnak, Survey map: Khanuk; vulg., K'ar-nak), a valley in Zangs-kar. Tsang: abridged from Tsang-k'a, a hamlet near Ho-mi. Mar: abridged from Martse-lang (Drew: Marchalong, Survey map: Marsahing), near He-mi. Of the combination Skyu-mar-nang: Skyu = Skew or Skio (Survey map) in the valley of Mark'a in Zangskar, Mar stands for Mar-k'r (Drew and Survey: Markha); Nang probably a hamlet in the same valley.—Me-ru (= Miru, Survey map) on the Gya river, one march south of He-mi. Dartse?

<sup>179</sup> In brackets are given the proper names of the lamaseries; the other names properly belong to the villages.

<sup>180</sup> Schl.'s edition.

<sup>181</sup> 1 Ladakh Rupee equal to ½ Rupee British coinage.

25 spears, 25 swords, 15 coats of mail, 25 pieces of silk, 10 pieces of brocade,<sup>182</sup> 25 pieces of gauze with and without a pattern,<sup>183</sup> 25 pieces of broad gauze for 'scarfs of blessing,'<sup>184</sup> and other presents in all past comprehension.

Then he reared the Leh-ch'en-pal-K'ar<sup>185</sup> (palace) of nine stories and completed it within about three years.<sup>186</sup> His own private utensils for religious worship<sup>187</sup> were all made of gold and silver and very numerous. He also caused a kagyur to be copied (the writing) in gold, silver and copper, and besides many other (religious) treatises and books.

I.—*An instalment of the Bower Manuscript.*—By DR. A. F. RUDOLF  
HOERNLE.

The portion of the Bower Manuscript which I publish in the following pages is that which I have marked in my paper "On the Date of the Bower MS.,"\* as the fifth. I placed it there as the last portion of the entire manuscript. That, however, was a mere matter of accident, this portion happening to be the last that I examined. What position the portion actually occupies in the entire MS., will have to be determined hereafter, when I have concluded the more thorough examination of the relic in which I am now engaged.

This portion of the manuscript is written on five leaves. They are regularly numbered from 1 to 5, on the left-hand margin, on the reverse sides of the leaves, in the old style of numeral figures.† On the reverse of the third leaf, however, a little distance below the current number 3, there are two other symbols which look like the number 51,

<sup>182</sup> Tib. རྩུག་ཁབ་ = Urdu : کیمڑاں

<sup>183</sup> Tib. མེན་རྩ་ = Silk-gauze with dots; རྩེད་རྩི the same without dots. The two words combined = མེན་རྩེད་

<sup>184</sup> Tib. ལ་ཤེ་ is the broad variety of this kind of loose gauze. For 'scarfs of blessing' see Hue and Gabet's Memoirs, Sir Monier Williams' book, etc.

<sup>185</sup> This is the palace of Leh, a conspicuous building immediately above the city.

<sup>186</sup> Tib. ལོ་ངོ་མཉུན་ comp. Jäschke's Dict. *sub voce* ངོ་རྩེ་པ་ངོ་པན་ meaning : 'the first half of the tenth month,' hence here we probably ought to translate : 'the first half of the third year.'

<sup>187</sup> Tib. གད་རྩོན་ covers the meaning of this entire expression.

\* See *ante*, p. 79.

† As shown in the *Indian Antiquary*, Vol. VI, p. 44, column 4.

i. e., one symbol for 50 and just below it another for one. What this means, I do not yet know; but probably it refers to the numbering of the verses.

The first leaf is only inscribed on the reverse side, the others, on both sides.

With regard to the material on which this portion (as well as the whole MS.) is written, I may notice some curious circumstances. One of them has already been noticed in the *Proceedings* for November 1890 (p. 223), that of the leaves, "some are in single thickness and others from two to four thicknesses." Of the five leaves of this portion, the first four consist each of four layers of bark, while the last has only two layers. Each layer is of extreme tenuity, almost transparent, and one layer by itself would hardly be fit for writing material. The fifth leaf, with its two layers, is still excessively thin. The several layers are not glued together, but appear to be in their natural state of adhesion; with some little trouble, it would not be impossible to separate them.

Another point also has been already mentioned by Professor Bühler in the *Vienna Oriental Journal*, Vol. V, pp. 103, 104, that the shape of the leaves is different from that of all other birch bark MSS., hitherto known. While the usual shape is nearly quarto, on which the lines of writing run parallel to the narrower side, after the manner of European books, in the Bower MS., the shape of the leaves is very decidedly oblong, the lines of writing running parallel to the long side, after the manner of the usual Indian paper or palm-leaf MSS. (*pôthi*). The dimensions vary in the different parts of the Bower MS. In the part, which I now publish, the leaves measure  $11\frac{1}{2}$  by  $2\frac{1}{2}$  inches. In agreement with this peculiarity is the further circumstance, that the leaves of the Bower MS. were never bound or made up in a volume, as the Kashmirian birch-bark MSS. are. In the latter MSS. every two of the square leaves above referred to form one sheet; the sheet is folded in the middle, and all the sheets, each making two leaves, are together done up in the form of a volume, very much as European volumes are. The art of preparing the birch-bark leaves so as to admit of this folding and doing up into a volume is now lost,—since the time of the introduction of the manufacture of paper into Kāshmir under Akbar about 200 or 250 years ago.\* The leaves of the Bower MS. are all separate, and were held together by a string passing through a hole in them. This hole, however, is not in the middle of the leaf, but at the distance of  $3\frac{1}{2}$  inches from the margin, or at about  $\frac{1}{3}$  of its length. In the ordinary Indian palm-leaf MSS., the hole is in the middle of the leaf, or if the leaves are very

\* See Prof. Bühler's *Report on the Search of Sanskrit MSS. in Kashmir* in *Journal, Bombay As. Soc., Extra Number for 1877*, pp. 29, 30.

long, there are two holes, at equal distances from the narrow margins. The arrangement in the Bower MS. is one-sided and curious. The whole Bower MS. was enclosed between two wooden boards with holes through which the string passed. In general appearance, therefore, the manuscript resembles Indian MSS. rather than the old Kashmirian.

The third point is, that the leaves at the time they were written on were already in a considerably damaged state. Of the third leaf a considerable portion, on the right hand side, is torn out. That this gap already existed at the time the scribe wrote his copy is clearly seen from the fact, that his lines carefully extend to the margins of the gap. There is no portion of the text of the manuscript wanting at this place, as it might appear at first sight. This circumstance seems to suggest the conclusion that at the place or at the time the scribe wrote, birch bark, as a writing-material, was difficult to obtain; and that he was thus forced to employ even very damaged leaves. On the other hand, it might be said that in that case he would not have wasted as many as **four** thickness in one leaf. Most of the bark, however, used in the leaves of the manuscript, is of a very inferior description; it is intersected by numerous faults in its texture,\* which, in most cases, would prevent a separation of the layers in unlacerated portions of sufficient dimensions to admit of being used as writing material. It appears to me plain that, for some reason or other, the scribe was obliged to content himself with material both of damaged condition and inferior nature. The inferiority of his 'paper' is also shown by the fact, that sometimes when he attempted to write across a fault, his letters would not form, and he was obliged to abandon a half-finished letter and trace it anew on the other side of the fault, thus leaving a more or less extended gap in his line.† Thus on fl. 3a7‡ we have विमि[ॠ]ञ्चो, fl. 3b<sup>6</sup> जी[ॠ]विदुक्कामः, fl. 5b<sup>2</sup> च[ॠ]वायाच, where the abandoned half-finished letters are indicated by brackets. See also fl. 2a<sup>9</sup>.

One further point may be also noticed in this connection. The manuscript shows clear traces of a revision by another hand. In the *Proceedings* for November 1890 (p. 223) it is stated that "the writing is entirely in black ink." This is undoubtedly correct; still, occasionally, letters occur in a very light (apparently faded) ink. A closer examination shows, that in many cases these light-ink letters indicate corrections.

\* Distinctly shown in the upper leaf of plate III in the *Proceedings* for Nov. 1890.

† Compare leaf No. 1 on Plato I in *Proceedings* of April, 1891.

‡ The large number refers to the leaf, the letter, to the side of the leaf ( $a$  = obverse,  $b$  = reverse), the raised numeral, to the line. Thus 3a<sup>7</sup> = 7th line on obverse side of 3rd leaf; fl. = folio or leaf.

Thus on fl. 4b<sup>9</sup> the original writing in black ink was *mē nu*, which is false, for *mē śriṇu*; here the akshara *śri* is inserted below, in the inter-linear space, in light-ink, and the proper place of insertion between *mē* and *nu* is marked by two minute strokes above those two aksharas. Again on fl. 3b<sup>3</sup> the original black writing was श्रीनी च; this is corrected into श्रीनी च, the visarga being inserted and the top-stroke of the second vowel *ô* cancelled by two minute strokes, all in light ink. Similarly in fl. 4b<sup>4</sup> *sa-mustāṃ* is corrected to *sa-mustāṃ*. It might be supposed that the original writer might have, on revision, made these corrections himself. But this is not probable,—for two reasons: firstly, occasionally a letter in light ink is met with in the middle of a word, in the ordinary line, showing that the original writer had left a blank which was afterwards filled in by the revisor. Thus in fl. 3b<sup>7</sup>, *ajarah*, and fl. 5b<sup>6</sup>, *lavaṇôpêtair*, the visarga and the akshara *ṇô* respectively are in light ink, while all the rest is in black. Secondly, occasionally a correction was made by the original writer himself, and these corrections are in the same black ink as the rest of the writing; thus on fl. 5a<sup>2</sup> the original writer first wrote सुष्वा which he afterwards altered to सुष्वा, all in black ink. He still left another error, which the revisor also did not notice, for the word should really be सुष्वा. These observations seem to suggest the conclusion, that the manuscript is a copy, prepared somewhat inaccurately by a scribe and afterwards revised by another person; and that, in any case, it is not the autograph of the composer of the work whoever he may have been. But neither did the revisor do his work accurately, for he overlooked some palpable mistakes, thus on fl. 3b<sup>1</sup> we have *munir* instead of *munibhir*; here the akshara *bhi* is omitted, but has not been supplied by the revisor, though the omission is clearly indicated both by the sense and the metre of the verse. Other similar errors I shall note further on.

With a small exception, the whole of the portion of the manuscript now published is written in verse. The metres employed exhibit a very great variety. They are the following:—

Metres.	Nos.	Verses.
1, Âryâ, ...	51½	51, 52, 53a, 86, 109, 110
2, Indravajra* ...	42½	12, 14, 23, 38, 67-85a, 88-103, 105-108
3, Ślôka ...	49½	10, 11, 28-30, 39, 43-50, 54-66, 87, 104, 111-131a

\* I e, either pure Indravajra or various combinations of Indravajra and Upēndravajra.

Metres.	Nos.	Verses.
4, Aupachchhandasika ...	4	17, 20, 21, 27
5, Kusumitalatâvellitâ ...	1(2)	81, (35)
6, Mâlinî ...	2	13, 42
7, Mandâkrântâ ...	1(2)	9, (35)
8, Mâyâ ...	2	36, 37
9, Pramâṇikâ ...	1	26
10, Pramitâksharâ ...	1	33
11, Prithvî ...	1	34
12, Sâlinî ...	2	24, 32
13, Sârdûlavikrîḍita ...	3	19, 40, 41
14, Sragdhara ...	1	18
15, Sudhâ ...	1	25
16, Suvadanâ ...	1	15
17, Tôtaka ...	1	16
18, Vap̄sasthavila ...	1	22
19, Vasantatilaka ...	9	1-8

Altogether there are 19 metres with  $129\frac{1}{2}$  verses between them. Most of them, however, are represented by only one or two verses; and all of them, except the three first-named, occur exclusively in the introduction of the treatise. The âryâ metre, on the other hand, is not employed in the introduction at all. The indravajra and ślôka, which are the most generally used metres, occur both in the introduction and in the body of the work, though more frequently in the latter. In fact the body of the work is, with the exception of the six âryâ verses, written throughout either in ślôkas or indravajras.

The only prose portions are : a longer passage between the 35th and 36th verses, and a short remark between the 48th and 49th verses.

The work consists of two distinct portions. The first is a sort of introduction which extends as far as the end of the 42nd verse, where after a great variety (18) of metres, the first long series of ślôkas commences. It treats of the discovery and the various medical uses of garlic (*laṣuna*).

The second portion, which forms the body of the work, may be described as a treatise on what in the Suśruta (II, 12 and IV, 20) are called the *kshudra-rôga* or minor diseases. It commences with verse 43; and includes several sub-divisions which are generally indicated by a change of metre.

The first sub-division extends to verse 50, and consists of eight ślôkas. It lays down a series of general physiological rules.



The second sub-division, down to verse 53a, written in two and one-half âryâ verses, is a sort of appendix giving a prescription, not intended for any particular disease, but to be used by healthy persons for the preservation of health.

The third sub-division, down to verse 58, consisting of five ślôkas, treats of the proportions and definitions of certain ingredients used in the composition of drugs.

The fourth sub-division, down to verse 66, consisting also of eight ślôkas, gives two (tonic) prescriptions, not intended against any particular disease, but to be used by persons in a low state of health, for the purpose of improving the general tone. The curious remark is here added (verse 66) that these tonics should not be administered to any one who has not a son or a disciple, nor to an enemy of the king, nor to any law-breaker.

The fifth sub-division, down to verse 85a, composed in indravajras, treats of the preparation and application of lotions (*âśchyôtana*) for the eye. It is marked off from the following sub-division by the interpolation of an âryâ (verse 86), giving a direction as to the preparation of other remedies, similar to the lotions, and a ślôka (verse 87), introducing the subject of plasters for the face (*mukha-lêpa*).

The sixth sub-division, down to verse 103, again composed in indravajras, treats of the preparation and application of plasters for the face (*radana-pralêpa*). It is also marked off from the following sub-division by a ślôka (verse 104), giving directions as to the size of those plasters.

The seventh sub-division, in indravajras, down to verse 108, treats of certain drugs which may be used either internally against general disorders of the system or applied externally as pastes (*viḍḍâlaka*) to the eyes. To this are added, in âryâs (verses 109 and 110), some other prescriptions for making such pastes or collyriums (*añjana*).

The eighth sub-division, down to verse 119, in ślôkas, explains the causes of hair diseases and gives directions as to their treatment.

The ninth sub-division, down to verse 131a, also in ślôkas, treats of remedies against various kinds of cough.

The two last-mentioned sub-divisions, which are both composed in ślôkas, are marked off from each other by the interposition of the sign ○, which always indicates the end of a subject or chapter.

As there is no colophon, or the usual ending, containing the name of the work and its author, it is doubtful whether the treatise contained in this portion of the manuscript is preserved complete.

The language in which the treatise is written is Sanskrit. There is, however, a noticeable difference in the Sanskrit of the narrative por-

tion of the introduction, and that of the rest of the work in which the prescriptions are detailed. In the former the Sanskrit is comparatively plain and correct, while in the latter it is very rugged and plentifully marked with all those anomalies of orthography, grammar, prosody and vocabulary which distinguish the early extra-scholastic Sanskrit of the North-West of India. The versifying powers of the author were evidently unequal to the management of the technical portion of the work.

I will now enumerate some of the more striking instances, that I have noted down, to illustrate the different kinds of anomalies that occur in the Sanskrit of the work. It might be objected that these apparent anomalies are mere copyists errors; and undoubtedly in a few cases, they are such errors; thus in fl. 5a<sup>1</sup> (verse 95) the MS. reading *nāsyē kṛitā vidhēyā pralēpāḥ* is clearly a mere clerical error for *nāsyē kṛitā* etc. But in most cases the surrounding circumstances forbid such an explanation, and show that the anomalies belong to the character of the language. It is also to be observed that the whole of the manuscript is very fairly free of clerical errors. I believe there are only about 17 cases which are certain to come under this description; in a few others, which I have also marked in my transliteration as false readings, it may be doubtful whether they are really errors or anomalies or simply slovenly writing. To the class of distinctly clerical errors belongs the omission of two whole pādas, as in fl. 3b<sup>3</sup> (verse 55), or of a whole syllable, as in fl. 3b<sup>1</sup> *munir* for *munibhir*, fl. 2b<sup>4</sup> *chha-madirām* for *chhāta-madirām*, or of a letter, as in fl. 2b<sup>6</sup> *prayujan* for *prayumjan*; again the substitution of a false word, as in fl. 3b<sup>2</sup> *pushṭi* for *pakti*, or of a false akshara, as in fl. 1b<sup>4</sup> *sōtan* for *sītan* or *śrōtan*, fl. 1b<sup>6</sup> *ātithauviva* for *ātithāviva*, fl. 2b<sup>3</sup> *śālyānna* for *śālyanna*; or again a totally blundered word, as in fl. 3a<sup>7</sup> *kāśyēshasnō* for *kāśaśvāsaghno*. On the other hand doubtful cases are such as fl. 3a<sup>4</sup> *undīram* for *udīram*, fl. 3a<sup>5</sup> *astrāni* for *astrāṇi* which more probably are real anomalies of the language; or such as fl. 1b<sup>4</sup> *sthitōdupati* for *sthitēndupati*, fl. 3a<sup>9</sup> *kṛitāś* for *kṛitābhāś*, where we have probably a correct letter written so slovenly as to resemble a false letter.

But to return to the anomalies: there are first the irregularities of orthography. The following are selected examples:

Doubling of consonants: precoding *r*: e. g., in fl. 2b<sup>2</sup> *k-kṛīḍi*, fl. 3b<sup>5</sup> *k-kriyā*; or preceding *y*, in fl. 5b<sup>4</sup> *siddhyati* and *sāddhyam*.

Confusion: of sibilants: e. g., *s* for *ś*, in fl. 4a<sup>3</sup> *kāsisa* for *kāśīsa*; *s* for *sh*, in fl. 2b<sup>8</sup> *kulmāsa* for *kulmāsha*; *sh* for *ś*, in fl. 5b<sup>7</sup> *shaḍi* for *śaṭi*; or *ṇ* and *n*: in fl. 3a<sup>5</sup> *kṛitāstrāni* for *kṛitāstrāṇi*, fl. 4b<sup>3</sup> *sthaunaiyaka* for *sthaunēyaka*; or of *ṛi* and *ri*, in fl. 3b<sup>6</sup> *mṛiyatē*

for *mriyaté*, fl. 4a<sup>7</sup> and 4a<sup>9</sup> *śritāni* for *śritāni*; fl. 3a<sup>10</sup> *krimi* for *krimi*.

**Prākriticisms**: omission of a final consonant: fl. 3b<sup>8</sup> *pushṭyā* for *pushṭyāḥ* (abl. sing.); fl. 3b<sup>7</sup> *samā* for *samāt* (abl. sing.); or simplification of a double consonant: fl. 3b<sup>11</sup> *śātalayōs* for *saptalayōs*.

**Use of the guttural nasal before ś and h**: fl. 1b<sup>9</sup> and 2a<sup>7</sup> *aṁśu* for *aṁśu*.

**Next morphological irregularities**:

**Peculiar inflexion**: in declension: fl. 2b<sup>11</sup> *nriṇā* for *nṛā*; fl. 5b<sup>1</sup> *sahīyaṁ* from a base *sahīya* for *sahīyas*. In conjugation: fl. 2b<sup>9</sup> *pāyayīta* for *pāyayēta*\*; change of class: fl. 5b<sup>3</sup> *pratapyēt* (IVth, rare, 'tō warm one's self') for *pratapēt*; ātm. for parasm.: fl. 2b<sup>3</sup> *śrinushva* (but fl. 3a<sup>9</sup> *śriṇu*), fl. 4b<sup>3</sup> *vinivartayēta* for *vinivarttayēt*.

**Change of gender**: neut. for masc.: fl. 3b<sup>8</sup> *utsāham* (but fl. 3b<sup>8</sup> *utsāhaḥ*), fl. 4a<sup>3</sup> *amaradāru*; masc. for neut.: fl. 3b<sup>11</sup> *lingas=cha*, fl. 4b<sup>3</sup> *āśchyōtanō vidhēyaḥ* (but fl. 4b<sup>3</sup> *āśchyōtanam*); fem. for masc.: fl. 5a<sup>3</sup> *rōdhrām* (but fl. 5a<sup>10</sup> *rōdhram*); fem. for neut.: fl. 5a<sup>10</sup> *ayō vighṛishṭām†* for *vighṛishṭam*.

**Next syntactical irregularities**:

**Exchange of cases**: acc. for nom.: fl. 5a<sup>6</sup> *dāham rujām sa-dāhām śānyanti* for *dāha rujā sa-dāhā*; nom. for acc.: fl. 5a<sup>3</sup> *mūrvvā=pi go-mūtra-yutām vadānti* for *mūrvvām-api*;‡ altogether the acc. and nom. cases are used very promiscuously, see under 'abnormal concord.' Instr. for nom.: fl. 2b<sup>11</sup> *nriṇā upakalpayēt* for *nā*; nom. for loc., fl. 5a<sup>5</sup> *vidrutaś=cha vadana-pralēpē* for *vidrutē cha*; gen. for acc., fl. 1b<sup>9</sup> *mālās=tat-parichārakasya janasya āropayēt* for *parichārakam janam*; gen. for dat.: fl. 2a<sup>6</sup> *bhujām prayōjyō* for *bhugbhyaḥ*; and loc. for dat.: fl. 4a<sup>3</sup> *rāja-dvishṭē na dātavyō* for *rājadvishṭāya*.

**Abnormal concord**: incongruent cases: acc. and nom.: fl. 3a<sup>1</sup> *prasthān dēyāḥ* for *prasthāḥ*; for other examples, see above. Incongruent genders: masc. and neut.: fl. 3a<sup>9</sup> *gunāpi prōchyamānān* (acc. pl.) for *prōchyamānāni*, fl. 4b<sup>3</sup> *ēsha śritas ... āśchyōtanam* for *ētat śritam*, 4b<sup>11</sup> *ētāni miśritā vā*; for other examples, see above under 'change of gender.'

**Abnormal construction**: many of the verses containing prescriptions

\* This, however, may be merely a case of slovenly writing of the vowel-mark.

† This may be due to the mere exigencies of the metre which here requires a long syllable.

‡ This, however, of course, would not have suited the metre.

are very halting and defy every attempt at regular construction. Thus in verse 36 (fl. 3a<sup>5</sup>) one would expect the accusative of *kuḍava* in dependence on *yumjyāt*; one would also rather expect *kāśaśvāsa-vighnaṃ viḍam*. Quite literally translated, the construction seems to be this: "Having crushed one cleaned prastha of garlic, one should join it with one half-pala of powdered triphala; and of both clarified butter and oil one kuḍava: this, when allowed to stand for ten days, they favour as a remedial 'viḍa' against cough and asthma." An other striking example is the prescription in verses 67-69; there is a wonderful mixture of accusatives and nominatives in verses 67 and 68; and the exact connection of *dvābhyaṃ tribhir* is doubtful. Verses, 75, 76, 91, 101 and others are equally difficult to construe.

Peculiar words or meanings of words: the following I have not found noted in any Sanskrit dictionary available to me:

- agra-manas* 'attentive' or 'intelligent', fl. 3a<sup>9</sup>.
- agaja* 'a kind of liquor', fl. 2b<sup>4</sup>.
- abla* 'mica' (syn. *abhra*), fl. 1b<sup>4</sup>.
- ✓ *abhi-vi-ji*, 'overcome', fl. 3a<sup>1</sup>, in *abhivijitya*.
- abhīlu*, some kind of eye-disease, fl. 4b<sup>6</sup>, 5a<sup>3</sup>, 5a<sup>5</sup>.
- utkshita*, 'besmeared', fl. 1b<sup>6</sup>.
- udaka*, 'water-animal', fl. 5b<sup>6</sup>.
- undīra*, 'excellent', fl. 3a<sup>4</sup>, (perhaps a false reading).
- upalābha*, 'resemblance', fl. 1b<sup>4</sup>.
- ushita*, 'allowed to stand', fl. 2b<sup>11</sup>; see *vyushṭa*.
- kriśa-bhās*, 'appearing lean', fl. 3a<sup>9</sup>, (if correctly read).
- khalita*, 'bald', in *a-khalitā*, fl. 5b<sup>3</sup>.
- jīvitū*, 'life', fl. 3b<sup>6</sup>, (perhaps a false reading).
- nikvātha*, 'boiling', fl. 3a<sup>8</sup>.
- nīlīka*, some kind of eye-disease, fl. 5a<sup>3</sup>.
- pilpa*, 'suppuration' (?), fl. 5a<sup>4</sup>; in *sa-pilpam*.
- ✓ *pra-śuṣh*, 'desiccate', fl. 4b<sup>11</sup>, in *praśūshya*.
- yashṭihva*, 'liquorice', fl. 5a<sup>3</sup>.
- varttyā* (fem.), 'bougie', fl. 3b<sup>8</sup> (syn. *vartti*).
- viḍa*, 'paste' (?), fl. 3a<sup>6</sup>, (cf. *viḍāḷaka*).
- ✓ *vēdh*, 'pierce', fl. 5b<sup>4</sup>, (cf. causal of ✓ *vyadh*).
- vyushṭa*, 'allowed to stand', fl. 2b<sup>7</sup>, 3a<sup>6</sup>, see *ushita*.
- vyatimīśra*, 'mixed', fl. 3a<sup>7</sup>.
- śhāḍi*, a species of plant, fl. 5b<sup>7</sup>, 5b<sup>8</sup>, (cf. *śaṭṭi*).
- śaṭṭya*, 'fortified with', 'joined with', fl. 5a<sup>11</sup>, 5b<sup>1</sup> (cf. *śaṭṭyas*).
- samśūdāna*, 'destroyer', fl. 3a<sup>10</sup>.

*suviraja*, 'fermented barley-water' or 'kâñjī,' fl. 2b<sup>5</sup>, (syn. *sauviraka*).

*sthaunaiyaka*, a species of plant, fl. 4b<sup>3</sup> (perhaps a false reading).

*śmārshmin*, 'having a sound body', fl. 3a<sup>1</sup> (perhaps a false reading).

Rare words: *athō* (for *athū*), 'then', fl. 4b<sup>5</sup>.

*āt*, 'afterwards', fl. 4b<sup>3</sup>.

*u* (?), 'then', fl. 2b<sup>3</sup>.

*Ēkadhyam*, 'together with', fl. 2b<sup>6</sup>.

Marks of interpunctuation: a symbol, exactly like the old numeral figure 'one', occurs twice, apparently as a mark of interpunctuation, on fl. 3b<sup>3</sup> and 3b<sup>4</sup>. The same symbol is also used to indicate a blank space at the beginning of the second and last lines on fl. 1b.

In this connection, I may note, that the two signs of the *Jihvāmūliya* and *Upadhmāniya* never occur, at least, in this portion of the manuscript.

The introduction affords some curious historical information. There were ten sages living together in the *Himālayas*: *Ātrōya*, *Hārīta*, *Parāśara*, *Bhēla*, *Ganga*, *Sāmbavya*, *Suśruta*, *Vasishṭha*, *Karāla* and *Kāpya*. Once the attention of *Suśruta* was attracted by a new plant, — it was the *laśuna* or garlic —, and he went to ask information from a Muni named *Kāśīrāja*. This Muni is then represented as giving to *Suśruta* all the medical information contained in the manuscript (see verses 9, 39).

This narrative agrees in one leading point with the opening statement of the well-known work, known as the '*Suśruta*.' There it is stated that *Suśruta* with other sages addressed the *Kāśīrāja*\* *Divôdāsa* *Dhanwantari* in his (Himalayan) hermitage and obtained their instruction in medicine from him. Of the companions of *Suśruta* seven only are named: *Aupadhēnava*, *Vaitaraṇa*, *Aurabhra*, *Paushkalāvata*, *Karavīrya*, *Gōpura* and *Rakshita*.† None of these agrees with the names given in our manuscript.

\* This *Kāśīrāja* is usually understood to be a title "king of *Kāśī* (Benares)"; though, even then, it does not follow that "the cultivation of medicine is by *Suśruta* himself expressly assigned to the city of *Kāśī* (Benares)" (see Weber's *History of Indian Literature*, p. 269); for *Suśruta* learned his medicine from the *Kāśīrāja* while the latter was living with other sages 'in retirement' (*āśrama*), which according to the usual precedents must be understood to be in the *Himālayas*. But from the way in which the name *Kāśīrāja* is used in our MS., it seems clear that it is understood as a proper name of a Muni. The names *Divôdāsa* and *Dhanwantari* do not occur at all in the MS.

† Three of them, *Aupadhēnava*, *Aurabhra* and *Paushkalāvata*, are again named at the end of the fourth chapter.

On the other hand some of the names mentioned in the introduction to the other well-known Hindû work on medicine, known as the 'Charakâ', agree with those in our manuscript. In that introduction it is said that Âtrêya taught medicine to his six pupils: Agnivêsa, Bhêla, Jatûkarṇa, Parâsara, Hârîta\*, and Kṣhârapâṇi. Four of these names are identical: Âtrêya, Bhêla, Parâsara, and Hârîta, but in every other respect the statements of the two authorities differ from one another. According to the Charaka, Âtrêya was the teacher of Bhêla, Parâsara and Hârîta, while according to our manuscript these four men were fellow-students, and were taught by Kâśirâja. In the Charaka, Suśruta is altogether omitted, while according to our manuscript, he was the most prominent in the company of fellow-students and their mouthpiece. This, of course, is explained by the fact, that the two works of Charaka and Suśruta, as we now have them, in the main represent two different schools or rather departments of medical science—the former, medicine, the latter, surgery. Of this assumed division there is no sign in our manuscript; nothing in its contents, though coming from Suśruta, is connected with surgery; and in its introduction both Âtrêya, the fountain-head of the Charaka, and Suśruta are mentioned in company. But neither the Suśruta nor the Charaka, as we now have them, are original works; they are clearly, both of them, recensions (probably much modified) of earlier works. The earlier work on which the Charaka Saṃhitâ is based was one written by Agnivêsa (said to have been a pupil of Âtrêya), and was probably still extant, as Dr. Dutt in his *Hindu Materia Medica* (p. vii) shews, at the time of Vâgbhaṭṭa. That the work now called Suśruta is not the composition of Suśruta himself, is shown by the opening salutation in which Suśruta himself, along with other divine personages, is invoked. Of what sort the two original works were, we have perhaps hardly sufficient right to conclude from their modern re-cast representatives. At the time of the composition of our manuscript, however, it is clear, the original work of Suśruta (the so-called *vṛiddha Suśruta*?) already existed.

That neither of the two works, now known as the Charaka and the Suśruta, can be accepted as ancient and original compositions, has been clearly shown by Dr. F. Haas, in his two Essays in the *Journal of the German Oriental Society* (vol. XXX, p. 617, and vol. XXXI, p. 647). The Suśruta, especially, would seem to be a comparatively modern compilation, somewhat loosely and unscientifically put together in the manner of the Purâṇas. But Dr. Haas goes much too far in his theory of the origin of that work, which, though seriously put forward, reads

\* Our MS. spells the name Hârîta, which is there guaranteed by the metre. I may here mention that a *Hârîta Saṃhitâ* (*Âtrêya-muni-bhâṣitâ*) has been edited by Kaviraj Binod Lal Sen. (Calcutta, Ayurveda Press, 146 Lower Chitpore Road).

much more like an elaborate joke. According to him the name *Suśruta* is only an Indian adaptation of the Arabic name *Suqrât* (سقراط), which itself is a confusion with *Buqrât* (بقرط), the Arabic corruption of the Greek Hippokrates (*ibid.*, p. 652). And in the name of the city of *Kâśi* (Benares), where (as Dr. Haas believes) the medical science is said to have originated, he sees an adaptation of the name of the island of *Cos* (κῶς), which was known to the Arabs to have been the native land of Hippokrates (*ibid.*, p. 654). Accordingly he holds, that the *Suśruta* was compiled somewhere between the 12th and 15th centuries A. D., and is based on information supplied by Muhammadan physicians (*ibid.*, pp. 666, 667).

One of the main pillars of this theory is the opinion held by Dr. Haas (and others), that according to the *Suśruta*, *Kâśi*-Benares is the place where Hindû medical science took its origin (see *ibid.*, pp. 627, 665, 654). This opinion is based on the statement, that “*Suśruta* and his companions addressed the *Kâśirāja* *Divôlâsa* *Dhanvantari* in his *Āśrama*”. Now even if it be right to take *Kâśirāja* as a title (‘king of *Kâśi*’) of *Divôdâsa* *Dhanvantari*, it does not follow that the *āśrama*, where the instruction took place, was in or near *Kâśi*. On the contrary, all that we know of Indian habits suggests that the meaning of *Suśruta* is that when the “king of *Kâśi*” communicated his instruction, he had resigned his kingdom and retired into an Himalayan retreat, to study and practice asceticism. This may be all invention, but it is just what would be consonant with the ideas of a Hindû author. But it seems to me, our manuscript renders it very improbable that *Kâśirāja* is a title; it may have been so in the thoughts of the author of the modern *Suśruta*, but in our manuscript itself it seems to be used rather as the proper name of a Muni. This takes away all force from the argument based on a supposed origin of the medical science in Benares.

But in his main principles, I am disposed to believe, Dr. Haas is correct. He distinguishes between an earlier and a later period of the literary cultivation of medical science among the Hindûs (*ibid.*, pp. 648, 650). The earlier period extends down to the arrival of the Arabs in India, who brought with them the knowledge of Greek medicine. To this period, Dr. Haas thinks, the *Charaka* may belong (*ibid.*, p. 651) as well as other treatises, no more now identifiable (*ibid.*, pp. 628, 629, 657). Two of the earlier works of the second period Dr. Haas considers to be *Vāgbhaṭṭa*’s *Asṭāṅga-hṛdaya* and the *Mādhava-nidāna* (*ibid.*, p. 649, 650). The *Suśruta*, as already remarked, he places also in the second period, but much later, after the 12th century. This may be true, so far as the work, now known as the *Suśruta*, is concerned; but that some *Suśruta* existed already in the earlier period, is now indisputably proved by our manuscript. It not only proves that a *Suśruta* existed

in the earlier period, but that its existence is traceable back to (at least) the fifth century A. D.; and this fact lends very strong support to the commonly held opinion that the *Kitāb-i-Susrud* (کتاب مسرود), mentioned by Ibn Abī Uṣaibi'ah (8th century A. D.), is really a 'book Suśruta'. But what particular Suśruta it may have been, it would be, at present, impossible to say.

Our manuscript,—at least in the portion, now published—shows some affinities to both the Suśruta and the Charaka. I have not yet been able to subject these two works to a very careful examination with a view to discover resemblances or identities. This, of course, is very desirable; and I hope to do so, as soon as I have more leisure. In the meantime I may note here a few coincidences that I have noticed in the course of a cursory glance through them. My references are to Pandit Jivānanda's editions;\* I regret, that no better editions are, at present, available to me. For the English translation of Suśruta I refer to that by Doctors Uday Chand Dutt and Aughtore Chunder Chatterpādhyā in the Bibliotheca Indica.

The only striking coincidence that I have noticed with regard to the Suśruta is the prescription given in verses 60-66. It refers to ten purgative pills (*mūlaka*), one of which is to be taken daily on ten consecutive days. A prescription, practically identical, occurs in Suśruta's Sūtrasthāna, Chapt. 44, ślokaś 50, 51 (p. 166, and transl. p. 211). The number of ingredients differs, but the principal ingredients are the same, and the number of pills and days is also the same. Moreover the place in the system where the prescription is introduced has some similarity. I have not been able to discover this particular prescription in the Charaka, though perhaps it may be found in it.

With regard to the Charaka I have noticed the following coincidences. In verses 121 and 122 there is a prescription against cough. The first portion of this prescription exhibits a very close resemblance to the first portion of a prescription occurring in the Chikitsita Sthāna of the Charaka, in its 20th chapter which deals with the treatment of cough. It is at the bottom of page 735. I have not found this prescription in the Suśruta. Another coincidence occurs in verse 66. Here we have the direction that a certain medicine "should not be administered to any one who has no son nor disciple, nor should it be given to an enemy of the king, nor to any other sinful liver." A very similar direction occurs in the Charaka, in the 8th chapter of the Vimāna Sthāna (p. 296):† "medicines should never be administered to the king's

\* Also Dallana Mishra's Commentary, the Nibandha Sangraha, published by Jivānanda Vidyāsāgara.

† Also quoted by Prof. von Roth in *Journal, German Oriental Society*, Vol. XXVI, p. 448.



enemies nor to the enemies of grandees (*mahājana*), nor to any whose habits are excentric, sinful or disagreeable, nor to any who will not obey directions, etc., nor to such as are on the point of death, nor to women whose husbands are absent or who have no protector.”\* In the Charaka this direction is a general one; in our manuscript it appears to have reference to a particular prescription. I may note, however, that the identical direction also occurs in the introduction to the first part of the Bower MS., where it is given, not with reference to a particular remedy, but, as in the Charaka, to medical assistance generally. .

On the other hand, I have noticed some particulars in which the views or rules of the Suśruta and the Charaka appear to me to differ considerably from those set forth in our manuscript. Thus in verses 43–50 the digestive faculty (*agni*) is made the basis of all vital conditions, the last of which is stated to be longevity (*āyus*), and the physician is advised to direct his first enquiries to the state of the digestion of his patient. In the Suśruta, however, (chapt. 35, Sūtrasthāna, p. 126, transl. p. 143) the physician is directed first of all to enquire into the longevity (*āyus*) of his patient, and only if he is satisfied on this point, he is to proceed to examine the patient's digestion (*agni*). Again in verse 43, food (*āhāra*) is mentioned as the first item in a series, not as being the first in the series of physiological states, but only because, as explained in verse 44, food is that which sets the digestive faculty (*agni*), the first of the vital functions, in activity. In the Suśruta, however, (chapt. 46 in Sūtrasthāna, p. 192, transl., p. 248) a much more important position is assigned to food (*āhāra*); it is made the basis of everything, of strength (*bala*), colour (*varṇa*) and vitality (*śūnya*). It would almost seem as if the writer of the Suśruta had misunderstood or exaggerated the reason why ‘food’ is placed first in the series in our manuscript. Again four kinds of digestion (*agni*) are distinguished: *sama*, *vishama*, *tikshṇa* and *mandā*. Now in verse 46 of our manuscript, the direction is given, in case of *vishama* or irregular digestion, to take curdled milk, clarified butter and the like. The same direction is also given in the Suśruta (chapt. 35 of the Sūtrasthāna, p. 131, transl., pp. 147, 148), but with reference to too active (*tikshṇa*) digestion. Another instance are the directions with reference to honey and urine. In our manuscript, verse 58, the use of these substances is limited to the products of the

\* The corresponding passage in the Suśruta is much shorter. It occurs at the end of the 2nd chapter of the Sūtrasthāna, and runs as follows: “Hunters, fowlers, outcasts and sinners (*pāpakārīn*) should not be treated.” (See p. 7, transl., p. 9). There is not much resemblance here, except perhaps in the term *pāpakārīn*, for which our MS. has *pāpachārīn*. In the Hārīta Samhitā the corresponding passage is entirely different: “The Āyurvēda should not be given indiscriminately to any one; it may not be given to unbelievers, nor to fools, nor to the low.” See Binod Lal Sen's ed., p. 3.

honeybee and the cow respectively; but in the *Suśruta* there is no such limitation, though bee's honey is said to be the best and cow's urine is enjoined to be used in preference to that of other domestic animals; see chapt. 45 in the *Sūtrasthāna*, pp. 184, 191, transl., pp. 235, 246, 247. There are some other substances, such as horn, hoof, etc., mentioned in verse 58; and with reference to all of these the use is limited to products of the cow. Similar, though not the same, substances are mentioned in the *Suśruta*, verse 12 of chapt. 37, *Sūtrasthāna* (p. 138, transl., p. 157), but here again their use is not limited to products of the cow. For another difference see footnote 71.

In the *Charaka* I have noticed the following instances of a difference. Both in our manuscript and in the *Charaka* three sorts of diseases of the hair are mentioned: *khāliya* 'baldness', *palila* 'grey hair', and *tāmrabāla* or (in the *Charaka*) *hari-lōman* 'red hair.' As remedies our manuscript prescribes (verses 117–119): venesections, emetics, unguents, hair-dyes and washings. The *Charaka*, on the other hand, directs the use of *nasyas* or 'the application of medicated substances to the nose' (see Dutt's *Materia Medica*, p. 17), unguents, and the applications of plasters to the scalp and the face; see the *Chikitsa Sthāna*, section on baldness, pp. 798, 799.

On the whole, therefore, I cannot say that—so far—I have discovered any very striking connection of the Bower MS. with either the *Suśruta* or the *Charaka*. It is different with the *Chakradatta*, or the *Chikitsa Sangraha*, a compilation from various medical works made by *Chakrapānidatta*. This appears to be a work, dating not later than from the 9th or 10th century (see Dr. Dutt, in his *Met. Med.*, p. xi). My references are to *Kaviraj Pyari Mohan Sen-Gupta's* edition. In this compilation I have found several of the prescriptions of the Bower MS., in almost identical words. Thus the prescription against cough, given in verse 123, occurs as the last of a set of three prescriptions, quoted in the *Chakradatta*, p. 210 (No. 2). The only difference is that the drugs are enumerated in a different order in the first half-line of the śloka. Again the prescription in verse 128 occurs in the *Chakradatta* on p. 216 (No. 70), and this time, in perfectly identical form. Again the prescription in verses 121 and 122, which I have already mentioned as also occurring in the *Charaka*, is also found in the *Chakradatta*, p. 210, as the second in the first set of two prescriptions. The agreement, however, only extends to the first portion, given in verse 121; and even here it is not very close. But this first portion, as given in the *Chakradatta*, is identical with the first portion, as given in the *Charaka*, on p. 735 (bottom). The second portion, as given in the *Chakradatta*, differs from the versions, given in both the *Charaka* and in our manuscript. I may add that the first prescription for cough, given in the

Chakradatta, on p. 210 (commencing with *vāstukṣ vāyasā śākaṃ*), occurs in identical words in the Charaka, on p. 736 (middle), and that there is a faint similarity in this prescription to that given in verse 120 of our manuscript. It is evident, that some of the prescriptions in Chakrapāṇi's compilation are taken from the Charaka; but I do not know whence he derived the others, which are identical with some in our manuscript (verses 123, 128). Further, the prescription in verses 121, 122 (commencing with *grāmyānāpa*) seems clearly to point to some connection between the medical work, contained in our manuscript and those in the Charaka and the Chakradatta. It would be satisfactory to be able to discover what the sources were on which Chakrapāṇi drew for his compilation; they are not specified anywhere, I believe, in his book.

For the sake of completeness I may add that in the first portion of the Bower MS., the introduction of which I have published in the *Proceedings* for April, I have come across several prescriptions which, in quite or almost identical terms, are incorporated in the Chakradatta.

There is another work which I have been able to examine cursorily and which offers a few examples of coincidences. This is the Vangasēna, by an author of the same name. It appears to be a compilation from different medical works, but professes to be a new recension of what was formerly known as the Agastī Saṃhitā.\*

The formula for the purgative pills, in verses 60–63 of our manuscript, which I have already noted as occurring in the Sūśruta, is to be found also in the Vangasēna, in one of its last chapters (the Virēchana Adhikāra), on p. 1020; and it may be noted, that in our manuscript, the composition of the formula is expressly ascribed to Agastī (in verse 61), whose work the Vangasēna professes to reproduce.† A very curious verbal agreement occurs in verse 84 of our manuscript. Its first half-line (*āśchyōtanam mānusha-dugdha yuktam* etc.) is found identically as the second half-line

\* This appears from the statement at the end of the book: *Agastī-saṃhit-ēyaṃ prāk=khyātā moḥ-janmatas=tataḥ | Gadādhara-grihē janma-labdā me punaḥ saṃskṛitā || Vangasēna iti nāmna vikhṛyātas-tad-anantaram | granthō='yaṃ sarva-siddhānta-sāraḥ śiḡhra-phala-ḥ ||* According to this statement Vangasēna was a son of the (physician) Gadādhara. The Vangasēna has been published by Nandakumar Gosvami, a Baidya of Bēri, District Rohtak, in 1889, at 57 Cotton Street, Calcutta. I owe the loan of my copy to the kindness of Pandit Hara Prasada Shastri.

† The versions in the Vangasēna and Sūśruta are practically identical; but differ a little from the version in our manuscript, see footnote to the translation. I have noticed other coincidences between those two works. For example, the whole of the remarks of the Vangasēna on urine (pp. 1103, 1104) and a portion of its remarks on liquors (p. 1103) are found verbally the same in Sūśruta I, 45 (p. 187, 191). Again the prescription against *pittābhishyanda* or ophthalmia, given in Sūśruta VI, 10 (p. 680, verses 2–5), is found in the Vangasēna in the chapter on eye-diseases, p. 789, verses 86–88. In this case, though the ingredients are the same, they are given in a different order.

of a formula given in the Vangasêna, on p. 788. The preceding formulas, however, are entirely different,\* and I have not been able to trace the formula of our manuscript in the Vangasêna, or *vice versa*. I may also note, that the formula, given in verse 76 of our manuscript for ophthalmia, shows a curious resemblance to that given in verses 107 and 108 of the Vangasêna (p. 791). There is also some slight resemblance between the formula, given in verses 70–72 of our manuscript, and that in the Vangasêna, verses 86, 87 (p. 789) and the corresponding verses 2–5 in the Suśruta (pp. 680, 681). It would seem that the options permitted in the formulas of our manuscript (verses 67–74), are made up into a large variety of distinct formulas in both the Vangasêna and the Suśruta.

I may note, that neither opium nor mercury is mentioned in our manuscript, though, as both drugs came into India with the Muham-madans, that goes without saying. But it may be noticed that the MS. mentions the *rīti-kusuma*, or calx of brass, in one of its prescriptions, in verse 109 (fl. 5a<sup>11</sup>), the knowledge of which, as Professor Garbe points out in his *Indische Mineralien* (p. 56), has been lost in India since many centuries. Also some other drugs, now no longer available, occur, such as the *jivaka*, *mēḍā*, etc.

Perhaps the mention of lions and elephants and of the light complexion of the people in the introductory verses 6, 41, and the omission of the winter in verse 92, should be noticed, as giving some indication regarding the place of composition of the work.

With regard to the edition and translation, I should explain, that the Nāgari transcript gives the text as it stands in the MS., broken letters or aksharas, of course, being printed in full; but where the consonant of a single akshara or a portion of a compound akshara was entirely lost, the missing portion is represented by a blank type (□), to which the extant portion of the akshara, whether vowel or consonant, is joined. Aksharas, which are wholly wanting, are indicated by dots,—in numbers equal to the missing aksharas. Aksharas which *now* are wanting, but which were still extant, when I first made my transcript, are enclosed within straight brackets.

In the Roman transliteration, I have attempted to show clearly the state of the original manuscript. Broken aksharas of the MS. text are indicated by round brackets; entirely missing portions are indicated by as many lengths and shorts as were shown by the metres to have existed. Occasionally, when it was practicable, I have made an attempt to restore the text. In some cases, this was easy and the restoration ob-

\* In the Vangasêna the verse runs as follows: *nimbasya patraiḥ parilipyā lōḍhram svā-āgninā chūrṇam=ath=āpi kalkam | āśehyōtanam mānusha-dugḍha-miśram pitt-dra-vāt-āpaham=agryam=uktam.*

vious, as the extant traces taken together with the metre and the context indicated clearly enough what the missing letters must have been. All such restorations, however, are invariably included within straight brackets.

The translation is necessarily somewhat free here and there, though always substantially faithful. I cannot feel certain, however, that I have always grasped the right meaning; the diction of the work is too rugged, and my acquaintance with medicine, limited. I have tried to obtain help, as far as I could, from Hindû practitioners. The Sanskrit names of the drugs I have retained, except in those few cases, where there are well-known English equivalents. In the case of those Sanskrit names, whose identity is certain, I have added in brackets their scientific equivalents; but in some cases I could not feel certain as to which plant or drug was really intended. I consulted chiefly Dr. Dutt's useful *Hindu Materia Medica* and Professor Garbe's *Indische Mineralien*; also Dr. Watt's *Economic Products of India*.

#### TRANSCRIPT.

First Leaf: Reverse.

- १ ओं देवर्षिसिद्धगणकिन्नरनागयक्षविद्याधराभ्युषितसानुरनन्तरत्नः  
पुण्यस्त्रिपिष्टपतनाम्बुतदेवरम्यः . □ . □ . . . . .
- २ नुदयः ॥ यत्र स्फुटन्मणिसहस्रमयूखजाज्विह्वोभितं दशसु दिक्षु  
भयात्यन्तलीनम् चन्द्रोद्गम्यैकतमुद्गिन्लयाभिग्रङ्गं प्रावृ .
- ३ शास्त्रपि पुनर्न तमो भ्युपैति ॥ यः सेव्यते मुनिगणैरनिष्टं सशिष्यै-  
र्नैकैः समित्कुशफलोदकपुष्पहस्तैः स्वर्गाङ्गनाभिरपि च प्रविष्ट्युपशाखाः
- ४ कुंजेषु यस्य तरवः कुसुमार्थिनीभिः ॥ यत्र त्रिलोचनजटामुकुटैक-  
देशनित्यस्थितोद्गतिदौधितिसंप्रयोगात् श्रोतन्दिवापि हिमवत्स्फटिकोप-  
जाभमब्दै-
- ५ न्दुकान्तमणयः प्रवरं स्ववंति ॥ यस्याब्दमुक्तजलधौतशिलातलेषु  
कुंजेषु नैकविधवीर्यगणादितेषु रम्येषु पुष्पफलदङ्गमसंक-
- ६ टेषु रात्रौ ऊताशनवदौषधयो ज्वलन्ति ॥ चन्द्रांशुगौरतरकेसर-  
भारभङ्गिर्मत्तेभमस्तकतटक्षतजोन्धितांशैः सिंहैः शिशोचयगुहावदना-
- ७ दृष्टासर्गं क्षम्यते मधुरवन्दरवो यि यत्र ॥ तस्मिन्गिरावनिमखल-  
मखभूते सर्व्वातिथौविव जगद्भिभवप्रदानैः सर्व्वर्तुपुष्पफलवद्भूमरम्य-

- ८ सानावेते विधूततमसो मुनयो वसन्ति ॥ आत्रेयह्यारितपराशर-  
भेजगर्गशांबयसुश्रुतवसिष्ठकराजकाप्याः सर्वैषधीरसगणाकृतिवीर्यनाम-  
९ जिज्ञासवः समुदिताः शतशः प्रचेरः ॥ दृष्ट्वा पचैर्हरितहरितैरिन्दु-  
नीलप्रकाशैः कन्दैः कुन्दस्फटिककुमुदेन्दुसुश्रुतैः उतपन्नास्थो  
१० मुनिमुपगतः सुश्रुतः काशिराजं किञ्चेतत्स्यादथ स भगवानाह तस्मै  
यथावत् ॥ पुराण्यतं प्रमथितमसुरेन्द्रः स्वयं पपौ तस्य चिच्छेद भगवानु-  
११ त्तमांगं जनार्दनः ॥ कण्ठनाडी समासन्ना विच्छिन्ने तस्य मूर्धनि  
विन्दवः पतिता भूमावाद्यं तस्येह जन्म तु ॥

Second Leaf: Obverse.

- १ न भक्षयत्येनमतश्च विप्राः शरीरसंपर्काविनिःकृतत्वात् गन्धोग्रताम-  
प्यत एव चास्य वदन्ति शास्त्राधिगमप्रवीणाः ॥ लवणरस[वियोगा]दाऊरेन  
रश्मून्मू  
२ लशुन इति तु संज्ञा चास्य लोकप्रतीता बज्रभिरिह किमुत्तैर्देश-  
भावाभिधानैः षडणु रसगुणवीर्याण्यस्य चैवोपयोगात् ॥ रसे च पाके च  
कटुः प्र  
३ दिष्टः पाके तथा स्वादुरदाहृतो न्यः लघुश्च गन्धेन सदुर्ज्वराश्र-  
वीर्येण चोष्णः प्रथितश्च दृश्यः ॥ आंक्षोष्णस्नेहभावात्पवनबलहरः  
४ प्रोक्तो मुनिवृधैः माधुर्यात्पित्तभावादपि च स रसतया पित्तप्रशमनः  
औष्ण्यात्तैदृशात्कटुत्वात्कफबलविजयी विद्वद्भिरुदितः सर्वाङ्गोगाग्निहन्त्या-  
दिति  
५ विधिविहितो दोषत्रयहरः ॥ पवनं विनिहन्त्वपि चास्थिगतं कफ-  
मप्यचिरादुदितं शमयेत् जनयेदपि चाग्निबलं प्रबलं बलवर्धकरः प्रव-  
६ रश्च मतः ॥ अथ बज्रविधमद्यमांससर्पिर्यवगोधूमसुजां सुखात्म-  
कानाम् अयमिह लशुनोत्सवः प्रयोज्यो हिमकाले च मधौ च माध-  
७ वे च ॥ त्वज्यंते कामिनीभिर्जनसमुचिता यत्र काक्षीकलापाः हाराः  
शैत्वान्न वक्षस्तनतटयुगलापीडनात्संप्रयांति कांता नेन्दुजाजयतिकरसु-  
भगाहर्ष्य-

८ पृष्ठोपभोगाः काले तस्मिन्प्रयोग्यो ह्यगुण बज्रमतं कुकुमांकाश्च  
यत्र ॥ हन्यायेष्वथ तोरणेषु बलभीदारेषु चाविष्कृताः कन्दाद्या लघुन-  
खजो विरचयेद्भूमौ

९ [त]थैवार्चनम् मालास्तत्परिचारकस्य च जनस्यारोपयेत्तन्मयीरित्य-  
स्यैव विधिर्जनस्य विहितः स्वर्णोवमानामतः ॥ अथ शुद्धतनुः शुचिर्विविक्तः

१० [सुरवि]प्राग्प्रतिपूज्य पावकं च लघुनात्स्वरसं पटांतपूतं प्रपिवेदङ्गि  
शुभयहर्त्तयुक्ते ॥ कुडवं कुडवाद्यापि चार्धं कुडवं सार्धमतो पि वाति[—]

Second Leaf: Reverse.

१ नियता न हि काचिदत्र मात्रा प्रपिवेद्दोषबलामयानि दृष्ट्वा ॥ स-  
तालवृत्त्यजनाजिज्ञैः शुभैः पवन्तमन समभस्पृशच्छनः

२ भवेदु मूर्च्छापि वतो पि वा यदि स्पृशेत्ततः शीतजलैः सचन्दनैः ॥  
सुराढतीयांशविमूर्च्छितस्य गण्डूषमेकं प्रपिवेद्रसस्य पूवं गलक्कीडिवि ..

३ हेतोः स्थित्वा मुहूर्त्तश्च पिवेत्प्रशेषम् ॥ तस्मिन्नीर्क्षे क्षीरशाल्यान्म-  
भुक्स्यात् क्षीराथोज्यो जांगलानां रसैर्वा हृद्यैर्युधैः संस्मृतैर्व्वेदलैर्वा युक्तः  
खेहैर्मात्रयैकं च

४ कालम् ॥ पिवेन्मार्दीकं वा मधु मधुसमांशाच्छमदिराम् अरिष्टं  
शीघ्रं वा जगलमगजं भैरेयमपि वा अतो न्यद्वा मद्यं भवति गुणवद्यत्त-  
त्सलिलम् पिवेदेकैकं वा न

५ भवति यथा मद्यव्यतिकरः ॥ अमद्यपः सुखोदकं पिवेत्तथाम्ल-  
कांचिकम् तुषोदकं सुवीरजं पिवेच्च मस्तु यच्छुभम् ॥ न गुडेन कथञ्चिदेन-  
मद्यान्न तथामश्च जलं पिवे-

६ त्रयुजन् सततश्च भवेदजीर्णशंकी न च खादेदबह्वनि वासराणि ॥  
अथ कन्दाहकुभाहकुत्सान्निष्ठान्सर्पिंश्च तत्समम् खजेनाभिप्रमथ्यैतदेकधं  
घृतभाजने ॥

७ व्युष्टं दशाह्वात्यभति भक्षयेद्विष्वसंमितम् जीर्णं च रसकल्पोक्त-  
माहारविधिमाचरेत् दावप्येतावमिहितौ कल्पौ प्रायहरौ मया अगयो-  
यंनवा-

८ मास्यात्कल्याणन्याकृत्तुयुष्य मे ॥ कन्दाकृत्तुभाणपङ्कतमलान्सक्तुकुल्या-  
सप्तुक्तैः सर्पिल्लैलाभ्यां समितविकृतैः सूपमांसप्रकारैः मौद्गैश्चूर्णैर्हरितकयु-  
९ तैर्गन्धसौवर्चलाक्षैरद्यात्संस्कारैर्वज्रभिरपरैः साधितान्वेतराणि ॥  
मांसैः साधं साधयित्वास्य काण्डं पूतं हृद्यं तं रसं पाययीत सिद्धं तद्वत्क्षी-  
रमस्मै

१० प्रदद्याद्युषं वा स्याद्द्वैदलं तद्विमिश्रम् ॥ अथ तैलशुक्तसहितं लशुनं  
निहितं यवेषु परिलिप्य मृदा स्थितमेकमब्दमुपयुज्य नरः सः ॥ ॥ ॥  
११ नपि जहाति गदान् ॥ त्रिरात्रमुभिता तुगौरनन्दया यदा स्यात्तदा  
नृणार्धमुपकल्पयेत्क्षश . . . . .

Third Leaf : Obverse.

१ . . दधिघृतानि तक्रमथ वापि तद्वाङ्माषः प्रयुज्य विविधान्गदानभि-  
विनित्य श्रमशीर्षी भवेत् ॥ प्रस्थान्दात्रिंशत्क्षशुनरसतः  
२ किण्वमर्धार्धमस्मात् तैलप्रस्थो व्यपगतमलः पिष्टतः षट् देयाः दद्या-  
न्निक्ताथादपिच कलशं मेषष्टंभ्याः  
३ सशीतं प्रस्थौ च द्वौ पुनरभिहरेत्तत्र पिष्टस्य धीमान् इति सुरेयं  
पंचपञ्चाहाद्रसवर्गुगन्धैः समन्विता  
४ भवति तैलं नामतस्त्रेदमुन्दीरमत्यर्थकामुं कम् तैलमेतद्यः सुरामपि वा  
पुरुषः प्रयुज्येत यत्नतः  
५ परिहरन्ति तं गदानीकान्याजौ कृतास्त्रानि वेतरे ॥ प्रस्थं पिष्ट्वा  
शोधितमेकं लशुनानाम् युज्याच्चूर्णैस्त्रैफलैरर्ध-  
६ पलिकैः सर्पिल्लैलाभ्यां कुडवश्चेति दशाहम् व्युष्टं कासश्वासविद्धं  
विघ्नमुशन्ति ॥ हन्याद्युक्तो मारुतगुल्मं पवनघ्नैः  
७ कुलं हन्याद्योजितमात्रं खदिरेण काश्यपिज्ञो ह्यगन्धाव्यतिमिश्रः  
स्वर्यः प्रोक्तश्चैव विमिश्रो मधुयष्ट्या ॥ नानाविधानेष निहन्ति रोगान्  
८ नानाविधद्रव्यविशेषयुक्तः न यंत्रणा कुत्रचिदस्ति कल्पे यथा प्रयुक्तः  
सुखिभिः स कल्पः ॥ रसायणवरस्यास्य प्रयुक्तस्य  
९ गुणानि मत् समासतः प्रोच्यमानान्सृज्यते ग्रमनाः षट्श ॥ कुष्ठारो-



चकगुल्मकासकृशताश्चिन्नाभिसादप्रणुत् वाताह्वगदरमूलशोषजठरज्वोद-  
राशोहरः

१० पक्षाघातकटिग्रहक्रिमिगदोदावर्त्तमेहापहः तन्म्रीपीनसवाङ्गपृष्ठप-  
वनापस्मारसंस्त्रदनः ॥ श्रीमन्मेषुद्वदंगवष्गुनिनदस्तप्ताग्रहेमद्युतिर्मेधाधी-  
बलवान्

११ ससंहततनर्वल्यादिभिर्वर्जितः नित्योत्साहसुतर्धिभिः समुदितैः सर्वै-  
र्हृत्तरिन्द्रियैः जीवेदब्दशतं दृढानलबलः स्त्रीष्वक्षयो वा . मा .

Third Leaf : Reverse.

१ . . . . लशुनाना कल्प उक्तो मयायम् मुनिरपि च दृष्टः प्राक्तनेरेव-  
मेव प . . न . . . . प्रयुक्ता च सम्यग् . . . . पृ . पृ . . . . .

२ आहारपुष्टिधातूनां साम्यमारोग्यमेव च पुष्टिस्तेजस्तथोत्साहमायु-  
श्चैवाभिसंभवाः अभिराहारमूलस्तु पक्तिमूलाश्च धातवः धातुसाम्यात्तथारो-  
ग्यमारोग्य . पुष्ट

३ रक्तमा पुष्ट्या तेजस्तथोत्साहः सर्वैरेतैश्च जीवितम् प्राणिनां वर्द्धते  
तस्मादभिमादौ परीक्षयेत् धातुसाम्यात्समः प्रोक्तः स वै श्रेष्ठः प्रकीर्तितः  
~ विषमे दाधिकं सर्पिः पिवेदा हवुषादिकम्

४ स्निग्धोष्णा वर्त्तयस्वेष्टास्तथा पानाशनानि च मन्दे तु जघनं पूर्व  
पश्चात्पाचनदीपनम् चूर्सारिष्टप्रयोगाश्च हिताः पित्तकफापहाः यथा-  
साध्यं प्रयोक्तव्यं समे भौ भिषजामिति ~ भव-

५ ति चात्र ~ मन्दे तीक्ष्णे च मृद्यते विनोपकरणर्जरः विषमे रोग-  
. वाङ्मयं समे जीवेच्चिरं सुखी तस्माद्रोगेषु सर्वेषु सर्वकालेषु बुद्धिमान्  
अभिमूला क्लिया

६ कार्या पश्चादामयशान्तये ॥ खरसेन शंखपुष्पा ब्राह्मी मण्डूकपर्णि-  
मधुकानाम् मेधारोग्यबलार्थी जीवितुक्तामः प्रयुज्यते मासेन तु मेधावी  
षणासाञ्जतधरो भवत्य-

७ जरः जीवति वर्षसहस्रं समा प्रयोगाञ्जतद्वयं विधिवत् एवं परतः  
परतः प्रयुज्यमानो भवत्यजरः ॥ . . . . ॥ ॐ

- ८ यवागूखडयूषेषु लेहचूर्णादिषु च गुडिकांजनवर्णांसु धूमप्रठमनेषु  
च पुटपाकतर्पणस्नेदेनावमनास्थोतनेषु च
- ९ अन्धेषु चाप्यनुक्तेषु यत्र भागो न कौर्त्तितः द्रव्याणां समभागः स्या-  
द्विगुणे मधुसर्पिंषी त्रिगुणं तु गुडं दद्यात्सिताचूर्णं चतुर्गुणम् पेथ्येषु य-
- १० च नोद्विष्टं ब्रवन्तत्र जलं मतम् दधिमूत्रपयःसर्पिरोमशृङ्गसफेषु च  
गन्धं प्रकल्पयेत्सर्व्वं मधूनां माक्षिकोद्भवम् ॥ दाडिमत्वचया
- ११ सार्धं कटुतैलं विपाचयेत् कक्षौ भगोष्ठौ लिंगश्च सर्व्व एतेन वर्धति ॥  
चित्रकार्धपलं मूलास्त्रिदत्तातलयोस्तथा
- १२ .. ० दन्तिमूलानां कर्षं कर्षं पृथक्पृथक् पिप्पल्याः सैन्धवाच्चैव तथा  
हिंग्वंलवेतसात् विंशतिस्त्रिभया मुख्या

Fourth Leaf: Obverse.

- १ . . . . [वि]प[र]चयेत् गुडस्याष्टपलात्सम्यक्कुर्वीत. दशमोदकान् एकैकं  
भक्षयेत्तस्माद्दशमे दशमे हनि दोषाणां पाचनार्थाय जलमुष्णं पिबेदनु  
विरेकान्ते ततः खात्वा सात्म्य-
- २ . ० प्रयोजयेत् नात्र कश्चित्परीहारो वाक्कायमनसां सदा सर्व्वतुको  
नरेन्द्राणां विरेको गस्तिनिर्मितः जरामृत्युप्रमथनः सर्व्वामयविनाशनः  
दृष्टो रसायनश्चैव
- ३ मेघारोग्याभिवर्धनः नापुत्राय प्रदातव्यो नाग्निध्याय कथञ्चन राज-  
द्विष्टे न दातव्यो ये चान्ये पापचारिणः ॥ द्वे पञ्चमूले मधुकं गुडूची रास्त्रा-  
श्वगन्धामरदार पाठा त्वचं व-
- ४ ले द्वे तगरन्तिलाश्च मूर्त्वा कुलत्थान्नलदं घनञ्च पुनर्नवां वेक्षुःफलत्वचं  
च जीवंत्ययैलागुरुजीवकश्च एरण्डमूलं सफलप्ररोहं कुरण्डपुष्पाणि
- ५ मद्दौषधं च द्वाभ्यां त्रिभिर्वा कथितं सतीयमाजं पयो गव्यमद्याविकं  
वा ससैन्धवं किञ्चिदतः सुखौष्णमास्थोतनं वातहृते क्षिरोगे ॥ दाक्षीत्यलं प-
- ६ द्यकतुंगयावामेदाम्बुलानं मधुकं समगा कालीयकं पर्य्यटका लता च  
प्राक्षाथ कार्शर्यपण्डुकं च मूलानि गुन्धानलवेतसानी अंगानि चाप्युष्वतां  
दद्या-

- ७ नाम् प्रपौष्टरोकं सकिराततिक्तं भद्रमिदं गिन्वपटोलवाग्राम् हौ  
 त्रीणि वाजे पयसि स्त्रिया वा अतान्यथाश्चोतनमुत्तमं स्यात् सशर्करं  
 माक्षिकसंप्रयुक्तं पैत्ते क्षि-
- ८ रोगे बधिरात्मके च ॥ त्रीण्युषणानि त्रिफला हरिद्रकासीसजाती-  
 मृदुधूमजातः क्षात्ताय दंतौ सुरसो वचा च पाठान्धगन्धामरदारु चाग्र्यम्  
 सकट्कलैलागुरुकण्ट-
- ९ कारी रोध्रं करझं वृहतीं श्वदंष्ट्राम् द्वे त्रीणि वातः सखिले अतानि  
 कोष्णानि कार्याणि ससैन्धवानि व्याश्चोतनं क्षौद्रकते क्षिरोगे मधुप्रगाढं  
 प्रवदंति संतः परुष . ।मा-
- १० तक्तितन्निडीकटुक्षाम्भजं ब्याम्भकपित्तकोलैः समतुलुंगैरथ दाडि-  
 माम्लैर्मद्यैः पयोभिर्दधिमस्तुना वा दार्युत्पलाद्यैः क्षाथितैश्च साम्लैराश्चोतनं  
 सैन्धवस . . .
- ११ . न्यासशीतोष्णकृतं गिहंति रक्तात्मिकां नेत्ररजं प्रसङ्गं संसर्गजे  
 सर्वसमुत्थिते वा ह्रीनाधिकत्वं प्रसमीक्ष्य रोगे कुर्वीति ॐ . ॐ . . . . .

## Fourth Leaf: Reverse.

- १ . पक्षरी विविधः ॥ शरदमूलं सफलप्ररोहं विजर्जरं क्षीरयुतं  
 त्वजानाम् स्याद्वातरक्तापहमेतदग्र्यमाश्चोतन . प्लवजो वदत ॥ प्रपौष्टरक  
 मधुक हरिद्रा क् . . . . .
- २ व्याश्चोतनं शर्करया विमिश्रं पित्तानिलासिं विनिवर्त्तयेत् ॥ नतं  
 श्वदंष्ट्रा वृहती त्वचश्च ज्वीवेरमित्येव श्वतस्त्वजानाम् क्षीरोदकैः सैन्धव-  
 संप्रयुक्तमाश्चोतनं वातकफापहं स्य .
- ३ दार्या मधुकं च मुख्यं गव्ये पयस्याक्लथितः स्त्रिया वा व्याश्चोतनो  
 मातृतरक्तपित्ते सशर्करः सद्भिषजा विधेयः ॥ चूर्सानि स्रष्ट्याणि फलत्रयस्य  
 बध्वा सिते क्षौमपटैकदेशे आजे . . स्य-
- ४ गनया जले वा परिश्रुतं सर्वरजपहं स्यात् ॥ दार्वीं हरिद्रां  
 त्रिफलां समुत्तं सशर्करं माक्षिकसंप्रयुक्तम् व्याश्चोतनं मालुषदुग्धयुक्तं  
 पित्ताश्रवातापहमग्र्यमुत्तमं ॥ शरदमूलैक-

- ५ दधौः सपत्रैः कलौरथो यष्टिकतयडुलानाम् हताश्रुतं श्रावकारप्रणिप्तं  
पूर्व्वेण कल्पेन राजापहं स्यात् ॥ खेदपुटपाकनाशनतर्पणहृतपानलेपपरि-  
षेकान् आस्थोतन-
- ६ निर्दिष्टैर्द्रव्यैरेतैः प्रकल्पयौत भिषक् ॥ ऋतुव्याधिहिताभीलुथंग-  
नीलीकनाशनान् विषशोथापहंश्चैव मुखलेपाग्रप्रचक्षते ॥ त्वक्क्षीरिणां  
चन्दनपद्मकौ च गुग्गांश्च-
- ७ गालं घनवालकौ च मूलं कुशानां तगरैलवालुतालीसपत्रं नजदं ति-  
लाञ्च मसूरदृव्वामयवं मृगालं रसञ्च यष्टीमधुकोत्पलानाम् शैलेयमुस्तागरु
- ८ भामकञ्च स्थौनैयकैलातगरं तिलाञ्च त्वक्कुत्रकुलागरुभामकञ्च मांसीं  
हरेणुं परिपेलवञ्च यष्टिऋरोध्रागरुचन्दनञ्च पुनर्नवाक्षणातिला कता च  
इत्यर्ध-
- ९ रूपैर्वदनप्रलेपैः कालेषु चर्मादिषु संप्रयोज्यः ॥ निदर्शिता दृष्टिहिता  
नराणां दोषापहन्मे षड्यु चोच्यमानान् वातामयघ्ना जलदागमोक्ताः पित्ता-
- १० मयघ्नाः शरदि प्रदिष्टाः ग्रीष्मोपदिष्टा बधिरामयघ्नाः कफामयघ्नाः कु-  
सुमागमोक्ताः कर्पासमूलान्यलतासुशीरकालीयका क्षीरवतां त्वचञ्च भद्रश्चि-
- ११ . . . . कं यवाञ्च वदन्ति वर्णान्वदनप्रलेपान् यतानि मूत्रेण गवां  
प्रशोध्य कोलाहलमूत्रैः सह मिश्रिता वा स्युर्मातुलुंगस्य रसे युता वा  
ससर्षपाः शोध्य

Fifth Leaf: Obverse.

- १ . . . . . कासु क्लृष्ट च दुष्ट बधिरे च मुक्त ज .  
वरेके विविधे च नास्ये कृता विधेया वदनप्रलेपाः त्वक्कुत्रमांसीनतचन्दनं च  
मनःशिला व्याघ्र
- २ . . . . . मू . क्लृष्ट कुष्ठ सुरसे हरिद्रे विषापहः स्युर्वदनप्रलेपाः ॥  
मूर्वाश्वगन्धा त्रिफला करञ्जं शोथापहः स्युर्वदनप्रलेपाः ॥ मूर्वापि गोमूत्र-  
युतां वदन्ति शोथापहं
- ३ ॐ वदनप्रलेपम् ॥ मुखे प्रणिप्ते न हस्तेन बध्यात्स्वप्नं न सेवेत तथा  
न आद्यात् नाभौ प्रतप्येन च धारयेत शुष्कं प्रलेपं वदने मनुष्यः क्षमीलु-  
नीलीकमथापि

- ४ कुष्ठं व्यंगं सपिच्छं तिलकांश्च जन्तोः शान्तिं सद्यो वदनप्रलेपाद्वृष्टिश्च  
वक्त्राच्च भवेत्प्रसन्नम् ॥ सुखे प्रसिते हस्ततो अतो वा स्नेहा सहायुः
- ५ स्वपतः प्रकोपः यात्याशु तस्माच्छिरसो विरेकाः स्नेहाश्च धूमाश्च पुनः  
प्रयोज्याः अभिप्रतापाद्विद्रुतश्च जंतोर्दृते च शुष्के वदनप्रलेपे व्यभिलु-
- ६ पूर्वार्धप्रवदंति रोगांस्तेषां यथोक्तां विदधीत शान्तिम् गन्तान्वतैमि-  
र्यंशिरोर्त्तिदाहं पित्तात्मिकां चक्षुरजां सदाहाम् दोषास्तथान्ये पि मुख-  
त्वचश्चाः शान्तिं सद्यो
- ७ वदनप्रलेपात् अक्ष्णोर्बिकारे कफमारुताभ्यां गन्तःकृते पीनसरोगिणां  
च हनुग्रहे शीर्षरजास्तु चैव वदंति वर्ज्यान्वदनप्रलेपान् अंगुलस्य चतुर्भांगो
- ८ मुखलेपो विधीयते मध्यमस्तु त्रिभागः स्यादन्य . . . . . भवेत् यष्टि-  
रुद्रोष्ठां त्रिफला मृद्यानं सितोपणां कांचनगैरिकश्च पत्रत्वगेलागुरु देवदारु  
पुनर्गवा व्याघ्रनखां-
- ९ जनश्च मनःश्लेष्माणं दृष्ट्वा त्वचश्च मांसीहरेऽपु . . पेनवं च सौवीरकं  
गैरिककटुकञ्च स्याच्छारिवा शर्करया विमिश्रा इत्यध्वंरूपश्चतुरः प्रदिष्टाः  
कफाखपिपादि .
- १० रोगशान्तौ विडालकैस्तेर्नयनं समन्तादापश्चमूलात्प्रदिहेद्वृष्टिं रौ-  
ध्रश्च किञ्चित्तु दृतेन दिग्धमयोविष्टुष्टामभयामथोवा त्वचं दृष्ट्वाः समम-  
ञ्जन . . .
- ११ लकः सर्वरजापहः स्यात् गैरिकरसांजनंजनमनःश्लेष्मा रौतिकुसुम-  
समभागाः ईषन्मरिचसहीया द्विगुणं ॥ . . . . .

Fifth Leaf : Reverse.

- १ मरिचकुसुमे च हरितं विपचेन्मृदभिना दृतसहीयम् अंजनविडा-  
लको यच्च कुञ्ज वक्ष्याम . . . ॥ . . . . .
- २ प्रोच्यमानं निबोधत रसदोशाद्यवायाच्च पित्तशोणितदूषणात् भव-  
त्यकालपणितं दृढस्य जरसा भवेत् प्रायेण स्नेहला नार्याश्वाया

निवेदित्यो रजो दुष्टं खजंति च प्रसन्नरक्तपित्तोष्माकेशभूमिरतः

स्त्रियाः न च्यवन्ति ततः केशाक्तस्मादखणिताः स्त्रियः पुंसामतो विपर्यासे  
रक्तपित्तं प्रदुष्य . . . .

४ क्लेशमूलानि खलतिं कुरुते शिरः ॥ निष्केशं ताम्रबाणञ्च खलित्वं  
यच्चिरोस्थितम् न तत्सिद्ध्यति साध्यन्तु नवं सन्यगुपाचरेत् खलित्वपलिते  
पूर्वं बज्रशो वेधयेत्सिराः

५ दुष्टशोणितशुद्धस्य वमनादिक्रिया हिता यद्यो . . . पश्चाच्छुद्ध-  
कोष्ठः प्रयोजयेत् तैलयोगांश्च विविधान्केशरागांस्तथैव च केशसंजननांश्चैव  
तथा संवर्द्धनानि च

६ प्रक्षालनाश्च केशानां यथा दोषहरा हिताः ॥ ॐ ॥ स्वाद्वम्भलवणो-  
पेतैर्घृतैर्मासतकासिनम् सान्नैरुपाचरेद्धौमान्केवलैर्वा यथावन्नम् ग्राम्यान्पुो  
दकरसैः सगुडैः सप-

७ काण्डुभिः अम्लखिगधोष्णमधुरैर्भोज्या गोधूमशालयः सुरां समखां  
घर्माभ्युत्थान्वापि प्रकामतः वातकासे बज्र खेहं सगुडं वा पयः पिवेत्  
शृङ्गवेरं षड्दीप्रा-

८ क्षाण्डगीपिप्पलिभार्गिभिः गुडतैलयुतो लेहो हितो मासतका-  
सिनाम् पिप्पली मासताजाजीषडीपुष्करचित्रकैः ससैन्धवमिदं चूर्णं हितं  
मासतकासिनाम्

९ पलानि क्वाथयेन्निशत्कण्टकार्या जलाढके चतुर्भागस्थिते पूते दद्या-  
द्गुडपलान्यगे चूर्णैर्भागरभाग्येणापिप्पलीषडिचित्रकैः घृततैलपत्रैश्चापि

१० संयतं लेहवत्यचेत् चतुर्भिर्वा घनीभावाच्छीते च द्विपलं मधु पिप्पली-  
पलचूर्णं च दत्त्वा लिह्यात्तु कासनुत् ॥ दशमूलकषायेण भार्गोक्लृप्तं घृतं पचेत्

११ . . . . . □ वातकासनुत् कण्टकार्या रसप्रस्थे घृतस्य कुडवं  
पचेत् पुनर्गवायाः कल्कोन तत्परं वातकासनुत् भार्गोक्लृप्तं घृतं चाथ  
पचेद्दधि चतुर्गुणे

१२ वाघोरसद्विगुणितं वातकासहरं परम् पैत्तिके सर्पिषः पानं हितं  
स्यात्सविरेचनम्

## TRANSLITERATION.

## First Leaf : Reverse.

- 1 Ōṃ <sup>1</sup>Dêv-arshi-siddha-gaṇa-kinnara-nâga-yaksha-vidyâdhar-âdhyu- 1  
shita-sânus=ananta-ratna(h)[1] puṇyas=tripiṣṭapa-tal(-âmbri)ta-  
dêva-rainyah[- - - - - - - - -]
- 2 n=udagrah ||[1 ||] Yatra sphuṭan-maṇi-sahasra-mayûkha-jâla-vikshô- 2  
bhitam daśasu dikshu bhayât=(pra)līnam[1] chandr-ôdra<sup>2</sup>-sûrya-  
hntabhuṇ-nīlay-âbhiśa[ū]ka[m] pr[â]vri[ḍ-ni]-
- 3 śâsv=api punar=n=ua tamô bhyupaiti ||[2 ||] Yah sêvyatê muṇi-gaṇair= 3  
anīsam sa-śiṣhyair=n=naikair samit-kuśa-phal-ôdaka-pushpa-has-  
taiḥ [1] svargg-âṅganâbhir=api cha pravimṛiṣṭa-śâkhâḥ
- 4 kumjêshu yasya taravah kusum-ârthinîbbih ||[3 ||] Yatra trilôchana- 4  
jaṭâ-mukut-aika-dêśa-nitya-sthit-ôdu-pati<sup>3</sup>-didhiti-samprayôgât[1]  
sôtan=divâ=pi himavat-sphaṭik-ôpalâbham=abhai.<sup>5</sup>
- 5 ndukânta-maṇyaḥ pravaram sravanti ||[4 ||] Yasy=âbda-mukta-jala- 5  
dhauta-śilâ-talêshu kumjêshu naika-vidha-vi-gaṇa-nâditêshu [1]  
ramyêshu pushpa-phala-da-druma-samka-
- 6 tōshu râtrau hutâśana-vad=aushadhayô jvalamti<sup>6</sup> ||[5 ||] Chandr- 6  
âṃśu-gaurataru-kêsara-bhâra-bhridbhir=matt-êbha-mastaka-taṭa-  
kshataj-ôtkshit-âṃśair [1] simhair śil-ôchchaya-guhâ-vadanâ-
- 7 tṭabâsair=n=na kshamyatê mbudhara-vrinda-ravô pi yatra ||[6 ||] Tas- 7  
min=girâv=avani-maṇḍala-maṇḍa-bhûtê sarvv-âtithauv<sup>7</sup>=iva jagad-  
vibhava-pradânair [1] sarvv-artu-pushpa-phalavad-druma-rainya-
- 8 sânv=êtê vidhûta-tamasô munayô vasaṃti ||[7 ||] Âtrêya-Hârita- 8  
Parâśara-Bhêla-Gargga-Sâmbavya-Suśruta-Vasiṣṭha-Karâla-Kâ-  
pyâḥ [1] sarvv-anśadhî-rasa-gaṇ<sup>8</sup>-âkṛiti-vîrya-nâma-
- 9 jijñâsavaḥ samuditâḥ śatasah prachêruḥ ||[8 ||] <sup>9</sup>Drishṭvâ patirair= 9  
harita-haritair=indranîla-prakâśair kandair kunda-sphaṭika-ku-  
mud-êndvanûsu-samkh-âbhra-subhraiḥ [1] utpann-âsthô
- 10 m[u]nim=upagatâḥ Suśrutâḥ Kâśirâjam kinnv=êtat=syâd=atha sa 10  
bhagavân=âha tasmai yathâvat ||[9 ||] <sup>10</sup>Pur-âṃṛitam pramathitam  
=asur-êndrah svayaṃ papau [1] tasya chichchhêda bhagavân=u-

<sup>1</sup> Metre of verses 1—8 : Vasantatilaka.<sup>2</sup> Read *êndra*.<sup>3</sup> Read *êndu-pati*.<sup>4</sup> Read *śrotan* or *śltan*.<sup>5</sup> Read *abde*.<sup>6</sup> Read *jvalanti* or *jvalamti*.<sup>7</sup> Read *âtithauv=iva*.<sup>8</sup> Read *gaṇa*, as in verse 13.<sup>9</sup> Metre : Mandâkrântâ.<sup>10</sup> Metre of verses 10 and 11 : *Ślôka*.

- 11 ttamāṃgaṃ Janārdanaḥ || [10 ||] Kaṇṭha-nāḍi samāsannā vichchinnē 11  
tasya mūrdhani [1] vindavaḥ patitā bhūmāv=ādyaṃ tasy=ēha janma  
tu || [11 ||]

## Second Leaf: Obyerse.

- 1 <sup>11</sup>Na bhakshaya[m]ty=ēnam=ataś=cha viprāḥ śārīra-samparkka-vinih- 12  
sritatvāt [1] gandh-ōgratām=apy=ata ēva ch=āsya vadamti śāstr-  
ādhigama-pravīṇāḥ || 12 || <sup>12</sup>Lavaṇa-rasa-viyōgād=āhur=ēnam rasū- 13  
na(m)
- 2 laśuna iti tu samjñā ch=āsya lōka-pratitā [1] bahubhir=iha kim= 12  
uktair=d=dēsa-bhāsh-ābhidhānaiḥ śrīṇu rasa-guṇa-vīryāny=asya  
ch=aiv=ōpayōgāt || [13 ||] <sup>13</sup>Rasō cha pākē cha kaṭuḥ pra- 13  
3 diṣṭaḥ pākē tathā svādur=udāhṛitō nyaḥ<sup>14</sup> [1] laghuś=cha gandhēna 14  
sa-durjjar-āsra-vīryēna ch=ōshṇaḥ prathitaś=cha vṛishyaḥ || [14 ||]  
<sup>16</sup>Āmbī-ōshṇa-snēha-bhāvāt=pavana-bala-haraḥ 15
- 4 prōktō muni-vṛishaiḥ <sup>16</sup>mādhuryāt=pitta<sup>17</sup>-bhāvād=api cha sa rasatayā 15  
pitta-prasamanaḥ [1] aushnyāt=taikshnyāt=kaṭutvāt=kapha-bala-  
vijayī vidvadbhir=uditāḥ sarvān=rōgān=nibhanyād=iti
- 5 vidhi-vihitō dōsha-traya-haraḥ || [15 ||] <sup>13</sup>Pavanam vinihanty=api ch 16  
=āsthi-gataṃ kapham=apy=achirād=uditam śamayēt [1] janayēt= 16  
api ch=āgni-balam prabalam bala-varṇa-karaḥ prava-
- 6 ras=cha mataḥ || [16 ||] <sup>19</sup>Atha bahu-vidha-madya-māmsa-sarpir-yava- 17  
gōdhūma-bhujām sukh-ātmakānām [1] ayam=iha- laśun-ōtsavaḥ 17  
prayōjyō hima-kālē cha madhau cha mādha-
- 7 vē cha || [17 ||] <sup>20</sup>Tyajyamti kāmīnibhir=jayana-samuchitā yatra kāñchī- 18  
kalāpāḥ hārāḥ śaityaṇ=na vakshas-tana-taṭa-yugal-āpīḍanāt=sam- 18  
prayānti [1] kāmīnī n=ēndv-auśu-jāla-vyatikara-subhagā-harmya-
- 8 prishṭh-ōpabhōgāḥ kālē tasmin=prayōjyō hy=aguru bahu-mataṃ 19  
kumkum-āṇikās=cha yatra || [18 ||] <sup>21</sup>Harmy-āgrēshv=atha tōra- 19

<sup>11</sup> Motre: Viparītākhanakī, alternate Indravajra (2nd pāda) and Upēndravajra (1st, 3rd and 4th).

<sup>12</sup> Motre: Mālinī.

<sup>13</sup> Motre: Viparītākhyānakī, alternate Upēndravajra (1st and 3rd pādas), and Indravajra (2nd and 4th pādas).

<sup>14</sup> Read *anyaiḥ*.

<sup>15</sup> Motre: Svadanā.

<sup>16</sup> This pāda does not scan; there are also other difficulties; see note to translation; it scans, if *sa* be omitted.

<sup>17</sup> Perhaps read *tikta*.

<sup>18</sup> Motre: Tōṭaka.

<sup>19</sup> Motre: Aupachohhandasika.

<sup>20</sup> Motre: Sragdharā.

<sup>21</sup> Motre: S'ārdūlavikṛīḍita.



ṇēshu valabbī-dvārēshu ch=āvishkṛitāḥ kand-ādhyā laṣuna-srajō  
virachayēd=bhūman

- 9 tath=aiv=ārchchanam [i] mālās=tat-parichārakasya cha janasy=ārō-  
payēt=tan-mayīr=ity=asy=aisha vidhir=j=janasya vihitāḥ svalpō  
vamānām=ātāḥ ||19 || <sup>22</sup>Attha suddha-tanuḥ suchir-v-vivi(ktā)ḥ 20  
10 sura-viprān=pratipūjya pāvakaṃ cha [i] laṣunāt=svarasaṃ paṭ-  
āṃta-pūtaṃ prapivēd=ahni śubha-grah-arksha-yuktē ||20 || ku- 21  
ḍavaṃ kuḍavād=ath=āpi ch=ārdhaṃ kuḍavaṃ sārdham=atō pi v=  
āti[mātraṃ]

### Second Leaf : Reverse.

- 1 niyatā na hi kâchid=atra mâtṛā prapivēd=dōsha-bal-āmayāni dṛishṭvā  
||21 || <sup>23</sup>sa-tālavṛi[nta]-(vya)jan-ānil(ai)ḥ (śubh)[ai](ḥ)(pa)van- 22  
tam=(ē)na[m] samabh[i](s)priś[ē]ch=chhan[ai](ḥ) [i]  
2 bhavē(d=u) <sup>24</sup>mūrchchhā=pi vatō pi vā yadi spriśēt=tataḥ śīta-jalaiḥ  
sa-chandanaiḥ ||22 || <sup>25</sup>surā-tritīy-āṃśa-vimūrchchhitasya gaṇ- 23  
ḍūsham=ēkaṃ prapivēd=rasasya [i] pūrvvaṃ gala-k-kr(i)ḍ(i)-  
v(i)[dhāna]-  
3 hētōḥ sthitvā muhūrttañ=cha pivēt=sa-sēshaṃ ||23 || <sup>26</sup>tasmiñ=jirṇṇē 24  
kshīra-śāly-ānna<sup>27</sup>-bhuk=syāt kshīr-āyōjyō jāṃgalānām rasair=v=  
vā [i] hṛidyair=yūshaiḥ saṃskṛitair=v=vaidalair=v=vā yuktaḥ snē-  
hair=mātray=aikaṃ cha  
4 kâlam ||24 || <sup>28</sup>pivēn=mārdvikaṃ vā madhu madhu-sam-āṃśāch= 25  
chha<sup>29</sup>-madirām arishṭaṃ śidhuṃ vā jagalam=agajaṃ mairēyam=  
api vā [i] atō nyad=vā madyaṃ bhavati guṇavad=yat=tat=sa-sali-  
lam pivēd=ēkaikaṃ vā na  
5 bhavati yathā madya-vyatikarāḥ ||25 || <sup>30</sup>a-madya-paḥ sukh-ôdakaṃ 26  
pivēt=tath=āmbla-kāṃchikam [i] Tush-ôdakaṃ suvīrajaṃ pivēch

<sup>22</sup> Metre of verses 20 and 21 : Aupachchhandasika.

<sup>23</sup> Metre : Vamśasthavila. The verse is much mutilated, and has been restored conjecturally with the aid of the metre. After *chhanaiḥ*, the leaf must have been broken off originally, before it was written on ; for as the metre shows, there can have been no more writing in the first line.

<sup>24</sup> The akshara *du* is not distinct ; possibly it might be *ttu* (*bhavēt = tu*).

<sup>25</sup> Metre : Viparītākhyānakī, alternate Upēndravajra (1st pāda) and Indravajra (2nd, 3rd and 4th pādas).

<sup>26</sup> Metre : Śālinī.

<sup>27</sup> Read *śāly-anna*.

<sup>28</sup> Metre : Sudhā.

<sup>29</sup> As the metre shows, there is here one long syllable wanting. I would propose to read *amśāch = chhāta*, i. e., *amśēt = śāta* (or perhaps *śānta* or *chhāta*).

<sup>30</sup> Metre : Pramāṇikā.

- =cha mastu yach=chhubham ||[26 ||] <sup>31</sup>na guḍēna kathañ-chid= 27  
 ēnam=adyān=na tath=āmañ=cha jalap pivē.  
 6 t=prayujan<sup>32</sup> [i] satatañ=cha bhavēd=ajirṇṇa-samkti na cha khādēd=a- 28  
 bahūni vāsarāṇi ||[27 ||] <sup>33</sup>Atha kandāñ=ch=chhubhāñ=ch=chhlaksh-  
 ṇān=pishṭān<sup>34</sup>=sarpiś=cha tat-samam [i] khajēn=ābhipramathy=  
 aitaḍ=ēkadhyam ghṛita-bhājanā ||[28 ||]  
 7 Vyusṭam daśāhāt=prabhṛiti bhakshayēd=bilva-sammitam [i] jirṇṇē 29  
 cha rasa-kalp-ōktam=āhāra-vidhim=ācharēt ||[29 ||] dvāv=apy= 30  
 ētāv=abhihitau kalpau prāgra-harau mayā [i] anayōr=yatnavā-  
 8 n=n=āsyāt=kalpān=anyāñ=ch=chhriṇushva mē ||[30 ||] <sup>35</sup>Kandāñ=ch= 31  
 chhañkh-ābhān=apahṛita-mālān=saktu-kulmāsa-chukraiḥ sarpiś-  
 tailābhyaṃ samita-vikritaiḥ sūpa-māmsa-prakāraiḥ [i] maudgaiś  
 =chūrṇair<sup>36</sup>=haritaka-yu-  
 9 tair=g=gandha-sauvarchchal-ādhyair=adyāt=samśkārair=bahubhir= 32  
 aparaiḥ sādhitān=v=ētarāṇi ||[31 ||] <sup>37</sup>Māmsaiḥ sārḍham sādhyaitv= 33  
 āsya kṇḍam pūtam hṛidyaṃ tam rasam pāyayīta [i] siddham  
 tat-vat=kshīram=asmai  
 10 pradadyāḥl=yūṣham vā syāḥl=vaidalaṃ tad-vimīśram ||[32 ||] <sup>38</sup>Atha 33  
 taila-śukta-sahitam laṣunam nihitam yavēshu parilipyā mṛidā [i]  
 sthitam=ēkam=abdām=upayujya naraḥ s o o i o e o i o [ā].<sup>39</sup>  
 11 n=api jāhāti gadān ||[33 ||] <sup>40</sup>Tri-rātram=ushitā tug=aurana-nṛiṇā<sup>41</sup> 34  
 yadā syāt=tadā nṛiṇā=rdham=upakalpayel=laś[una] [ - - - -  
 - ] [i]

31 Metre : Anpachchhandasika.

32 Read *prayujan*, as shown by the metre.

33 Metre of verses 28—30 : Ślōka.

34 This is a curiosity; the final *n*, which should be properly conjunct with the initial *s* of *sarpiś*, is attached to the head of the subscribed *ṭa* of *pishṭa*, because the big akshara in the line, just above, interfered with the proper writing of the conjunct *nsa*.

35 Metre : Kusumita-latā-vellitā.

36 Here, as the metre shows, one long syllable is wanting.

37 Metre : Śālinī.

38 Metre : Pramitāksharā.

39 Here five syllables are lost, which, as shown by the metre, should be *u u u*. The first syllable must be either *su* or *sa*; of the following three syllables the vowels (*i*, *e*, *i*) are preserved; of the 5th syllable the vowel must be *ā*, to make up an accusative plural, ending in *ān* and agreeing with *gadān*. The phrase should have some such meaning as "obstinate" or "long enduring" (disease); *su-chire sthitān* may be suggested.

40 Metre : Prithvī.

41 Read *tug-drata-nṛiṇā* (for *tugd arata-nṛiṇā*), (P)

## Third Leaf: Obverse.

- 1 [—] (dadhi)-ghritāni takkram=athav=āpi tad=brāhmaṇaḥ pray-  
ujya vividhān=gadān=abhi vijitya (śmarshmī) bhavēt || [34 ||] 35  
<sup>42</sup>Prasthān=dvātrimśal=laśuna-rasataḥ  
 2 kiṇvam=ardh-ārdham=asmāt taila-prasthō vyapagata-malah piṣṭa-  
 taḥ śaṭ=cha dēyāḥ [1] dadyān=nikvāthād=api cha kalasam mēsha-  
 śṛṅgyāḥ  
 3 sa-sītam prasthau cha dvau punar=abhiharēt=tatra piṣṭasya dhīmān  
 || 35 || <sup>43</sup>iti sur=ēyam pañcha-pañch-āhād=rasa-varuṇa-gan-  
 dhaiḥ samanvitā  
 4 bhavati tailam nāmataś=ch=ōdam=undiram<sup>44</sup>=atyartha-kārmukam  
 tailam=ētat=yah surām=api vā puruṣaḥ prayujyā yatnataḥ  
 5 pariharamti tam gad-ānikāny=ājau kṛit-āstrāni<sup>45</sup> v-ētarē || <sup>46</sup>Pras- 36  
 thaṁ piṣṭvā sōdhitam=ēkam laśunānām yujyāch=chūrṇanais=  
 traiphalair=ardha-  
 6 palikaiḥ [1] sarpiś-tailābhyām kuḍavaś=ch=ēti daśāha(m) vyushtaṁ  
 kāsa-śvāsa-vidam vighnam=usanti || [36 ||] Hanyād=yuktō mā(ru)ta- 37  
 gulmam pavana-ghnaiḥ  
 7 kushthaṁ hanyād=yōjita-mātram khadirēṇa [1] kāśyēśhasnō<sup>47</sup> haya-  
 gandhā-vyatimīśraḥ svaryāḥ prōktaś=ch=aisha vimiśrō madhu-  
 yashtyā || [37 ||] <sup>48</sup>nānā-vidhān=ōsha nihanti rōgān 38  
 8 nānā-vidha-dravya-viśeṣa-yuktaḥ [1] na yamtraṇā kutra-chid=asti  
 kalpē yathā prayuktaḥ sukhibhiḥ sa kalpaḥ || [38 ||] <sup>49</sup>Rasāyana- 39  
 varasy=āsyā prayuktasya  
 9 guṇāni mat [1] samāsataḥ prōchyamānān=Suśrutai<sup>50</sup> gra-manāḥ śṛiṇu ||  
 [ 39 ||] <sup>51</sup>kushth-ārōchaka-gulma-kāsa-kṛisatāschitr<sup>52</sup>-āguisāda- 40  
 praṇut vāt-āśrigdara-sūla-sōsha-jāthara-plihōdar-ārsō-haraḥ [1]

<sup>42</sup> The metre of verse 35 is a mixture of alternate Kusumitalutāvellitā and Mandākrantā. I cannot discover its specific name.

<sup>43</sup> The following appears to be prose, thought it consists of two parts, each of thirty-nine syllables.

<sup>44</sup> Read *udīrnam*.

<sup>45</sup> Read *kṛitāstrāni*.

<sup>46</sup> Metre of verses 36 and 37: Mattamayūra or Mâyā. But the 2nd pāda of verse 36 does not scan and is short by one syllable; also the 3rd pāda of verse 37 is disfigured by a clerical error.

<sup>47</sup> Read *kāsaśvāsaghnō*, as shown by the metre.

<sup>48</sup> Metre: Ākhyānakhī, a combination of Indravajra (first two pādas) and Upēndravajra (last two pādas).

<sup>49</sup> Metre: Sīlōka.

<sup>50</sup> Read *suśrutā*.

<sup>51</sup> Metre of verses 40 and 41: Sārdūlavikṛīḍita.

<sup>52</sup> Read *kṛisā-bhās-chitra*; t and bh are two consonants of very similar form.

- 10 pakṣāḡhāta-kaṭigraha-krimigad-ôdāvartta-mêh-āpahaḥ tandri-pīna-  
sa-vāhu-prishṭa-pavan-āpasmāra-samsūdanaḥ ||40 || śrī-mān= 41  
vōnu-mṛḍaṅga-valgu-ninadas=tapt-āgra-hēma-dyutir=m=mêdhā-  
dhī-balavān
- 11 s(u)-samphata-tan(u)r=valy-ādibhir=varjitaḥ [1] nity-ôtsāha-su-tar-  
dhibhiḥ<sup>68</sup> samuditaiḥ sarvvair=d=drīḍhair=indriyaiḥ jivêd=abda-  
śatam drīḍh-ānala-balaḥ strish(v)-akṣhayô vā [pu](mā)[n] || 41 ||

**Third Leaf: Reverse.**

- 1 54[ ( ) ( ) ( ) ( ) ] (laśunā)nā[ṁ] kalpa uktô may=âyam munir<sup>55</sup>=api cha 42  
 drishṭaḥ prāktanair=êvam=êva [i] pa[ ( ) ( ) ( ) ( ) - - - ]pra-  
 yuñktâ[ṁ] cha samyag=[ ( ) ( ) ( ) ( ) ] o ri [ ( ) ] o ū o y o [ - ( ) - -  
 ( ) - - || 42 || ]
- 2 56Āhāra-puṣṭi<sup>57</sup>-dhatūnām sām̐yam=ârôgyam=êva cha [i] puṣṭis= 43  
 tējas=tath=ôtsāham=âyns=ch=aiv=âgni-sambhavaḥ [ || 43 || ] agnir= 44  
 āhāra-mūlas=tu pakti-mūlās=cha dhātavaḥ [i] dhātu-sām̐yāt=tath  
 =ârôgyam=ârôgy[āt]=pu[sh][t][i]-
- 3 1=uttamā [ || 44 || ] puṣṭyā tējas=tath=ôtsāhaḥ sarvvair=êtaiś=cha jivi- 45  
 tam [i] prāṇinām bardhatê tasmād=agnim=ādau parikṣhayê 46  
 [ || 45 || ] Dhātu-sām̐yāt=samaḥ prôktaḥ<sup>58</sup> sa vai śrêṣṭhaḥ prakirt-  
 itaḥ | <sup>59</sup>vishamê dādhikam sarpiḥ pivêd=vā havush-ādika(m)  
 [ || 46 || ]
- 4 snigdha-ôṣṇā vartayaś=ch=êṣṭās=tathâ pân-âsanāni cha [i] mandê 47  
 tu lamghanam pūrvvam paśchât=pāchana-dīpanam [ || 47 || ] 48  
 chūrṇa-āriṣṭa-prayôgās=cha hitāḥ pitta-kaph-āpahāḥ [i] yathā-  
 sātmyam prayôktavyam samê gnau bhishajām=iti<sup>59</sup> [ || 48 || ] Bhava- 49
- 5 ti ch=ātra || <sup>60</sup>Mandê tīkṣṇê cha mriyatê vin=ôpakaraṇair=n=naraḥ 49  
 [i] vishamê rôga-bāhulyam samê jivêch=chiram sukhi [ || 49 || ] 50  
 Tasmād=rôgêṣhu sarvvêṣhu sarva-kālêṣhu buddhimān [i]<sup>60</sup> agni-  
 mūlā k=kriyā
- 6 kār̐yā paśchād=ām̐aya-sām̐tayê [ || 50 || ] <sup>60</sup>Sva-rasēna śamkha pushpyā 51  
 brāhmī-maṇḍūkapaṇṇi-madhukānām [i] mēdh-ârôgya-bal-ārthi

53 Read *su-varḍhibhiḥ*.

54 Metre : Mălinț.

55 Read *muniḥhir*, as shown by the metre (of 15 instants) and the sense.

56 Metre of verses 43—50 : Ślōka

<sup>57</sup> Read *pakti*, as shown by the context in verse 44.

<sup>58</sup> The text had originally *prôktô*, which was afterwards corrected, in a lighter ink, to *prôktah*, a visarga being inserted and the vowel *ô* cancelled by two strokes.

59 Here, and in three other places, the original has a mark of interpunctuation, resembling the ancient numeral figure *one*.

60 Metre of verses 51—53a :  $\hat{\text{AryA}}$ . See note 62.

- jīvitū<sup>61</sup>-kāmaḥ prayujjita [॥ 51 ॥] māsēna tu mēdhāvi shaṇ-māsāch 52  
 =chhruta-dharô bhavaty=a-
- 7 jarah [i] jīvati varsha-sahasraṃ samā prayôgāch=chata-dvayaṃ vi-  
 dhivat [॥ 52 ॥] ēvaṃ parataḥ parataḥ prayujjamānô bhavaty=a 53  
 jarah ॥ . . . ॥ <sup>62</sup> [॥ 53 ॥]
- 8 <sup>63</sup>Yavagû-khaḍa-yûshēshu lêha-chûrṇ-âgadēshu cha [i] guḍik-âṃjana-  
 varttyāsu dhûma-praṭhamanēshu<sup>64</sup> cha [॥ 54 ॥] <sup>65</sup>puṭapāka-tar-  
 ppaṇa-svêdēnâ-vaman-âschyôtanēshu cha [॥ 55 ॥] 54 55
- 9 anyēshu ch=âpy=anuktēshu yatra bhâgô na kirttitah [i] dravyānām  
 sama-bhâgaḥ syād=divi-guṇē madhu-sarpishî [॥ 56 ॥] tri-guṇam 56 57  
 tu guḍam dadyât=sitâ-chûrṇam chatur-guṇam [i] pēshyēshu ya-
- 10 tra n=ôddishṭam dravan=tatra jalam matam [॥ 57 ॥] dadhi-mûtra-  
 payah-sarppi-rôma-śringa-saphēshu cha [i] gavyam prakalpayēt  
 =sarvvaṃ madhûnām mâkshik-ôdbhavam [॥ 58 ॥] Dâḍima-tva- 58 59  
 chayâ
- 11 (sâ)rdham kaṭu-tailam vipāchayēt [i] karṇau bhag-ôshṭhanu limgaḥ  
 =cha sarvva êtēna vardhati [॥ 59 ॥] Chitrak-ârdha-palam mûlât= 60  
 trivrit-sâtalayôs=tatha [i]
- 12 ◡◡◡ dan(t)i-mûlânām karsham karsham prithak=prithak  
 [॥ 60 ॥] pippalyâḥ saindhavâch=ch=aiva tathâ himgv-ambla- 61  
 vêtasât [i] vimpsatis=ch=âbhayâ-mukjâ

## Fourth Leaf: Obverse.

- 1 [◡—◡—] vipāchayēt [॥ 61 ॥] guḍasy=âshṭa-palât=samyak=kurvita 62  
 dâsa-môdakân [i] êkaikam bhakshayēt=tasmâd=dâsamê dâsamê  
 hani [॥ 62 ॥] dôshânām pâchan-âarthāya jalam=ushṇam pivêd=anu 63  
 [i] virêkâmtê tataḥ snâtva sâtmya-
- 2 [m=an]n[am] prayôjayēt [॥ 63 ॥] n=âtra kaś-chit=parihârô vâk-kāya- 64  
 manasām sadâ [i] sarvv-artukô narēndrāṇām virêkô gasti-nirm-

<sup>61</sup> Perhaps read *jīvita-kāmaḥ*.

<sup>62</sup> This (circle with central dot) is the usual mark to denote the end of a subject. On the corresponding place of the left hand margin there are two figures, the lower of which is the numeral *one*, and the upper one is apparently 50; if so, the two together would be 51, which would seem to refer to the counting of the verses, though I count 52 or rather 52½ verses up to this point. There are two points, however, to be noted: first, the MS. inserts four dots, which seem to indicate a lacuna; secondly, verse 51 is a regular *āryā* of 30 and 27 instants, but verse 52 has two long lines of 30 instants each, and the following half verse consists of a short line of 27 instants. Of verse 53 only one-half exists.

<sup>63</sup> Metre of verses 54—66: *Ślōka*.

<sup>64</sup> Read *pradhamanēshu*.

<sup>65</sup> This verse is a fragment, two entire *pādas* being lost.

- mitaḥ [¶ 64 ¶] jarā-mṛityu-pramathanāḥ sarvv-āmaya-vināśanāḥ 65  
 [1] vṛishyô rasāyanas=ch=aiva
- 3 mēdh-ārôgy-ābhivardhanāḥ [¶ 65 ¶] n=âputrāya pradâtavyô n=âi- 66  
 shyāya kathan-chana [1] rāja-dvishṭe na dâtavyô yê ch=ānyê  
 pâpa-châriṇaḥ [¶ 66 ¶] <sup>66</sup>Dvê paṃcha-mûlê madhukam guḍûchī 67  
 rāsn=āsvagandh=āmaradâru pāṭhā [1] tvacham ba-
- 4 lè dvê tagaran=tillās=cha mûrvvām kulattḥân=naladam ghanāñ=cha 68  
 [¶ 67 ¶] punarnnavām vëṇu-phala-tvacham cha jivamty=ath=aail=  
 āguru-jivakaś=cha [1] éraṇḍu-mûlam sa-phala-prarôham kuraṇḍa-  
 pushpāṇi
- 5 mahausadham cha [¶ 68 ¶] dvābhyām tribhir=vā kvathitam sa-toyam 69  
 =ājam payô gavyam=ath=āvikam vā [1] sa-saindhavam kim-chid  
 =ataḥ sukh-aushṇam=āśchyôtanam vāta-kṛitê kshi-rôgê [¶ 69 ¶]  
 Dārby=utpalam pa- 70
- 6 dmaka-tumga-yāshā-mēdā-mṛiṇālam madhukam samamgā [1] kālīya- 71  
 kam parppatakā latā cha drāksh=ātha kārshmarya-parûshakam  
 cha [¶ 70 ¶] mûlāni gundrā-naḍa-vētasānām sumpāni chā<sup>67</sup> push-  
 pavatām triṇā-
- 7 nām [1] prapaṇḍarikam sa-kirātatikṭam bhadrāsriyam nimba-paṭôla- 72  
 vāśām [¶ 71 ¶] dvau triṇi v=âjê payasi striyā vā śritāny=ath=  
 āśchyôtanam=uttamam syāt [1] sa-śarkkaram mākshika-samppra-  
 yuktam paittê kshi-
- 8 rôgê rudhir-âtmakê cha [¶ 72 ¶] Triṇy=ûshañāni triphalā haridr[ā] 73  
 kāsisa-jāti-grihadhūma-jātyaḥ [1] lāksh=ātha damṭi surasô vachā  
 cha pāth=āsvagandh=āmaradâru ch=āgryam [¶ 73 ¶] sa-katphal- 74  
 ail-āguru-kaṇṭa-
- 9 kârî rôdham karañjam vṛihatim śvadamshṭrām [1] dvê triṇi v=â- 75  
 taḥ salilê śritāni kôshyāni kâryāni sa-saindhavāni [¶ 74 ¶] āśchy-  
 ôtanam slêshma-kṛitê kshi-rôgê madhu-pragâdham pravadamṭi  
 samtaḥ [¶] Parûsha[k]-ām[r]ā-
- 10 taka-tintidika-vṛikshāmbala-jamvv-āmra-kapittha-kôlaiḥ [¶ 75 ¶] sa- 76  
 mātulumgair=atha dāḍim-āmbalair=madyaiḥ payôbhir=d=dadhi-  
 mastunā vā [1] dārvy-utpal-ādyaiḥ kvathitais=cha s-āmbalair=  
 āśchyôtanam saindhava-sap[prayuktam] [¶ 76 ¶]
- 11 (-)nyāsa-śil-ôshṇa-kṛitam nihamṭi rakt-âtmikam nētra-rujam pra- 77  
 sahya [¶] Samsargga-jê sarvva-samutthitê vā hin-ādhiakatvam  
 prasanikshya rôgê [¶ 77 ¶] kurvvi(ta) □ m - □ r □ ∪ - ∪ - - 78

66 From here down to verse 85a, the metre is, in various combinations, a mixture of Indravajra and Upēndravajra.

67 Read vā.

## Fourth Leaf: Reverse.

- 1 <sup>68</sup>—pahar(1) vivijñāḥ [ ] Ēraṇḍa-mūlam sa-phala-prarôham vijar-  
jaram kshira-yutam tv=ajānām [ ] 78 [ ] syād=vāta-rakt-āpaham 79  
=étad=agryam=āśchyôtana[m sad]bh[i]shaj(ô) vada[m]t[i] [ ] Pra-  
paunḍar[i]ka[m] madhuka[m] haridrâ[ñ] chha — — — — —  
— — [ ] 79 [ ]
- 2 āśchyôtanam śarkkarayâ vimisram pitt-ânul-ârttim vinivarttayêta [ ] 80  
Natham svadamshtrâ-vṛihati-tvachañ=cha hrivêram=ity=êsha śpi-  
tas=tv=ajānām [ ] 80 [ ] kshîr-ôḍakaiḥ saindhava-samprayuktam= 81  
āśchyôtanam vâta-kaph-āpaham syâ(t) [ ] ( — — )
- 3 Dârvyâ madhukam cha mukhyam gavyô payasy=ât=kvathitah striyâ  
vâ [ ] 81 [ ] āśchyôtanô mâruta-rakta-pittê sa-śarkkarah sad-bhi- 82  
shajâ vidhêyah [ ] Chûrṇāni sūkshmanî phala-trayasya badhvâ sitê  
kshauma-paṭ-aika-dêśê [ ] 82 [ ] âjê [payas]y[=am]— 83
- 4 ganayâ<sup>69</sup> jalê vâ pariplitam sarvva-ruj-āpaham syât [ ] Dârvvim hari-  
drām triphalām sa-mustam<sup>70</sup> sa-śarkkaram mākshika-samprayuk-  
tam [ ] 83 [ ] āśchyôtanam mânusha-dugdha-yuktam pitt-āsra-vât- 84  
āpaham=agryam=uktam [ ] Ēraṇḍa-mūlais=ta-
- 5 ruṇaiḥ sa-pattaiḥ kalkair=athô shashṭika-taṇḍulânām [ ] 84 [ ] ghṛit- 85  
āplutam śâva-kara-praliptam pûrvvêna kalpêna ruj-āpaham syât [ ]  
[85 [ ] <sup>71</sup>Svêda-puṭapâka-nâbana-tarppaṇa-ghṛitapâna-lêpa-pari- 86  
shêkân [ ] āśchyôtana-
- 6 nirddishṭair=dravyair=êtaiḥ prakalpayita bhishak [ ] 86 [ ] <sup>72</sup>Ritu- 87  
vyâdhi-hit-âbhilu-vyanga-nîlika-nâśanân [ ] visha-shôth-āpaham  
=ś=ch=aiva mûkha-lêpân=prachakshatê [ ] 87 [ ] <sup>73</sup>Tvak-kshirîṇam<sup>74</sup> 88  
chandana-padmakau cha gundrām mṛi-
- 7 nâlam ghana-vâlakau cha [ ] mûlam kuśânām tagar-ailavâlu tâlîsa-  
patram naladam tilâś=cha [ ] 88 [ ] masûra-dûrvv-âma-yavam mṛi- 89  
nâlam rasaś=cha yashtîmadhuk-ôtpalânām [ ] sâilêya-must-âguru
- 8 jhâmakañ=cha sthaunaiyak<sup>75</sup>-ailâ tagaram tilâś=cha [ ] 89 [ ] tvak- 90  
patra-kushṭh-âguru jhâmakañ=cha mâmsim harêṇum paripêla-

<sup>68</sup> Here four syllables appear to be omitted, for which I can discover no place either at the bottom of the obverse, or at the top of the reverse of the fourth leaf.

<sup>69</sup> The mutilated phrase must, I think, be *payasy=amganayâ* 'in the milk of a woman'; though the correct form would be *amganâyâ*; the short *a* is probably due to the exigencies of the metre.

<sup>70</sup> The text originally had *sa-mustām*, which by a later hand is corrected to *sa-mustam*.

<sup>71</sup> Metre: Âryâ.

<sup>72</sup> Metre: Ślôka.

<sup>73</sup> Metre of verses 88—103: either Indravajra, or some combination of Indravajra and Upêndravajra.

<sup>74</sup> Read *kshîrîṇam*.

<sup>75</sup> Read *sthaunâyaka*.

- vañ=cha [i] yashtihva-rôdhr-âguru chandanañ=cha punarnnavâ  
krishṇa-tilâ latâ cha [ 90 ] ity=ardha- 91
- 9 rūpair=v=vadana-pralêpaih<sup>76</sup> kâlêshu gharm-âdishu samprayôjyah<sup>76</sup> |  
nidarsitâ drishṭi-hitâ narâṇaṃ dôsh-âpahân=mê śriṇu<sup>77</sup> ch=ôchya-  
mânân [ 91 ] Vât-âmaya-ghnâ jalad-âgam-ôktâḥ pitt-â- 92
- 10 maya-(ghnâ)ḥ śaradi pradishṭâḥ [i] grīshṃ-ôpadishṭâ rudhir-âmaya-  
ghnâḥ kaph-âmaya-ghnâḥ kusum-âgam-ôktâḥ [ 92 ] Karppâsa- 93  
mûlân̄y=alatâm=usîra-kâliyakâ kshiravatâṃ tvachas=cha [i] bha-  
draśri-
- 11 [ya] [— ∪ —]kam yavâś=cha vadamti varṇyân=vadana-pralêpân  
[ 93 ] êtâni mûtrêṇa gavâṃ prasôshya kôl-âmba-mûtraiḥ saha 94  
misritâ vâ [i] syur=m=mâtulungasya rasê yutâ vâ sa-sarshapâḥ  
sôshya

## Fifth Leaf : Obverse :

- 1 [— ∪ — —] <sup>78</sup> [ 94 ] — — ∪ — — ∪ — ∪ — ∪ (kâsu) kl[i]sht(ê) cha 95  
dusht[ê] rudhirê cha mukt[ê] [i] (s)n[êhê] v[i]rêkê vividhê cha  
nâsyê kritâ<sup>79</sup> vidhêyâ vadana-pralêpâḥ [ 95 ] Tvak-patra-mâ- 96  
ṃsi-nata-chandanam cha manahsilâ vyâghra-
- 2 [nakham] ∪ — — (m)<sup>80</sup> [i] • (âmb)l(i)ka-kushṭh[am] surasê haridrê  
vish-âpahâḥ syur=vadana-pralêpâḥ [ 96 ] Mûrvv-âśvagandhâ 97  
triphalâ karañjam sôth-âpahâḥ<sup>81</sup> syur=vadana-pralêpâḥ [ 97 ] Mûrvv<sup>82</sup>=  
âpi gô-mûtra-yutâṃ vadamti sôth-âpaham
- 3 [s]y[âd]=va(d)ana-pralêpam [ 97 ] Mukhê praliptêna hasên=na rud- 98  
yât=svapnam na sêvêta tathâ na ch=âdyât [i] n=âgnau pratapyên=  
na cha dhârayêta sushkam pralêpam vadanê manusyah [ 98 ] 99  
Abhîlu-nîlikam=ath=âpi
- 4 kushṭham vyamgam sa-pilpam<sup>83</sup> tilakâm=s=cha jantôḥ [i] sâm̄yamti sa-  
dyô vadana-pralêpâd=drishṭis=cha baktrañ<sup>84</sup>=cha bhavêt=prasan-  
nam [ 99 ] Mukhê praliptê hasatô snatô vâ slêshmâ sa-chhâyuh<sup>85</sup> 100

<sup>76</sup> Read *pralêpâḥ* and *samprayôjyâḥ*.

<sup>77</sup> The text originally had only *nu*; the syllable *śri* was afterwards inserted interlinearly in a lighter shade of ink.

<sup>78</sup> Perhaps fill up with *mukhê vidhêyâḥ*.

<sup>79</sup> Read *kritê*.

<sup>80</sup> The lacuna may be filled up with *harêṇum*; compare verses 105 and 106, where also we have *vyâghranakhâṃ* and *harêṇum*.

<sup>81</sup> Read *sôth-âpahâḥ*.

<sup>82</sup> The letters look rather like *myavvâpi*. The fact is, the original writing was *muuvvâpi*, which was, rather clumsily, corrected to *mûmâpi*. But read *mûrvvâpi* (*mûrvvâpi*).

<sup>83</sup> Or perhaps *sa-pilpâ*.

<sup>84</sup> Read *vaktrañ = cha*.

<sup>85</sup> Read *sa-vâgyuh*.



- 5 svapataḥ prakôpaḥ [1] yâty-âsu tasmâch=chhirasô virékâḥ snêhâs=cha  
dhûmâs=cha pumaḥ prayôjyâḥ [100] Agni-pratâpâd=vidrutaś 101  
=cha jantôr=dhritê cha śushkê vadana-pralêpê [1] abhîlu-
- 6 pûrvvân=pravadaṃti rôgâṃ=s=têshâṃ yathî-ôktâṃ vidadhita śântim  
[101] Nakt-ândha-ñaimirya-śirô-rtti-dâhaṃ pitt-âtmikâṃ 102  
chakshu-rujâṃ sa-dâhâṃ [1] dôshâs=tathâ=nyê pi mukha-tvacha-  
sthâḥ śâmyanti sadyô
- 7 vadana-pralêpât [102] Akshnôr=v=vikârê kapha-mârutâbhyâṃ 103  
nastaḥ-kritê pinasa-rôgîṇâṃ cha [1] hanu-grahê śirsha-rujâsu ch  
=aiva vadaṃti varjyân=vadana-pralêpân [103] <sup>86</sup>Amgulasya 104  
chatur-bhâgô
- 8 mukha-lêpô vidhiyatê [1] madhyamas=tu tribhâgaḥ syâd=anty<sup>87</sup>  
— — — — — bhavêt [104] <sup>88</sup>Yashtihva-rôdhrâṃ triphalâ mṛiṇâ- 105  
lam sit-ôpalâṃ kâṃchana-gairikañ=cha [1] patra-tvag=êl-âguru  
dêvadâru punarnnavâ vyâghranakhâṃ-
- 9 janañ=cha [105] manahsil-âlam vṛihatî-tvachañ=cha mâṃsi- 106  
harê[n]u[m] pari]pêlavam cha [1] sauvirakam gairika-katphalañ=  
cha syâch=chhârivâ śarkkarayâ vimisrâ [106] ity=ardha-rûpâis 107  
=chaturâḥ pradishṭâḥ kaph-âsra-pi(tt-ânila)-
- 10 rôga-śântau [1] vidâlakais=tair=n=nayanam samantâd=â pakshma-  
mûlât=pradihêd=bahir=v=vâ [107] Rôdhrañ=cha kim-chit=tu 108  
ghṛitêna digdham=ayô vighṛishṭâm=abhayâm=athô vâ [1] tvacham  
vrihatyâḥ samam=añjana[ñ=cha vidâ]-
- 11 lakḥ sarva-ruj-âpahaḥ syât [108] <sup>89</sup>Gairika-rasâṃjan-âṃjana- 109  
manahsilâ-ritikusuma-sama-bhâgâḥ [1] iṣhan-maricha-sahiyâ dvi-  
guṇam 110 [110] — — — — — 111

## Fifth Leave: Reverse.

- 1 Maricha-kusumê cha haritam vipachên=mṛidv-agninâ ghṛita-sahiyam 110  
[1] âṃjana-vidâlakô yañ=cha ku[r]vv (vakshyâma) — —  
[110] <sup>90</sup> — — — — — 111  
[1]
- 2 prôchyamânam nibôdhata [111] Rasa-dôshâd=vyavâyâch=cha 112  
pitta-śôpita-dûshaṇât [1] bhavaty=akâla-palitam vridhdhasya jarasâ  
bhavêt [112] Prâyêṇa slêshmalâ nâryâs=chhâyâ śa [- — — 113  
— — — — —]

<sup>86</sup> Metre: Ślôka.<sup>87</sup> The verse might be thus completed: *antya:s = tv = ardh-ângulô = bhavêt.*<sup>88</sup> Metre of verses 105—108: combinations of Indravajra and Upêndravajra.<sup>89</sup> Metre of verses 109 and 110: Âryâ.<sup>90</sup> Metre of verses 111—113a: Ślôka.

- [illegible]

91 Or perhaps *chhir-ôttthitam*.

92 Supply perhaps *yath-ôchit-âśanam*.

<sup>98</sup> Supply *dakṣa-tittiri-niryūḥe tat-param* from the Chakradatta, formula 70 on

## Translation.

(Verse 1.)—Om! The summit of boundless wealth, inhabited by companies of Dêvarshis and Siddhas, by Kinnaras, Nāgas, Yakshas and Vidyādhara, the holy pleasure-ground of the immortal<sup>1</sup> gods that inhabit heaven, [all].....overtopping;

(Verse 2.) Where, scattered in every direction by reason of the multitude of the rays of thousands of protuberant gems, and dissolved by fear, darkness, being apprehensive of the abode of the Moon, Indra, the Sun and Fire, does not venture to approach even in the nights of the rainy season<sup>2</sup>;

(Verse 3.) Which is incessantly worshipped by numerous companies of sages accompanied by their disciples, carrying wood, kuśa-grass, fruits, water and flowers; in whose groves the trees have their branches examined<sup>3</sup> by the celestial maidens in quest of flowers;

(Verse 4.) Where, under the magic of the rays of their lord, the moon, who has his permanent abiding-place on the crest of matted hair of the Three-eyed-one (i. e., Siva), the two gems, talc<sup>4</sup> and the moon-stone, even by day, let flow a mighty stream,<sup>5</sup> just as if they were<sup>6</sup> glacier-ice;

(Verse 5.) In whose beautiful groves, crowded with flower and fruit bearing trees, resounding with the voices of swarms of various kinds of birds, and having their rocky ground washed by the water emitted from the talc<sup>7</sup>, the medicinal plants glow at night like sacrificial fires;

1 The reading *amṛita* (for *amṛita*) is doubtful. But I can make nothing better of the mutilated letters.

2 The suggestion of the reading *prāvarid-niśīsv=api* I owe to the Pandit of the Asiatic Society.

3 Or: touched.

4 The MS. reads *abda*, lit. 'cloud.' As this is a synonym of *abhra*, which means both 'cloud' and 'talc', I take *abda* also to mean 'talc.' It is not given, with this meaning, in any Sanskrit dictionary accessible to me; but the context clearly requires two minerals which should be both transparent and of a whitish or bluish white colour. Both talc and moonstone possess these qualities. The difficulty, however, is that mica or talc is not exactly a *maṇi* or gem. Another difficulty is, that both *abda* and *indukānta* are said to have the moon for their lord. This is true of the moon-stone, but I am not aware of its being ever ascribed to talc. Yet I do not know what else *abda* could be but talc.

5 The MS. reading *śītan* gives no sense. I conjecture *śrōtan*, i. e. *śrōtam* 'current', accusative of *śrōta*, or *śītan* (i. e., *śītam*) 'water.'

6 The original has *upaldbham* which, in this sense of 'resembling,' has not yet been noted in any Sanskrit dictionary. Literally it means 'catching up', 'reaching up to'.

7 The original has *abda-mukta*, which admits of a double meaning: 'emitted from talc' or 'pearl-like talc'.

(Verse 6.) Where the lions, with thick manes brighter than the rays of the moon, *and* shoulders besmeared with the matter oozing from the sides of the heads of elephants in rut, do not brook even the thunder of masses of clouds, but roar with mouths like mountainous caverns ;

(Verse 7.) On that mountain, *which* is, as it were, the cream of the whole earth *and*, through its gifts of the riches of the world, the benefactor of all *creatures*,—on its summit, delightful with its trees bearing flowers and fruits at all seasons, there dwell the following Munis of enlightened mind :

(Verse 8.) Âtrêya, Hârîta, Parâsara, Bhêla, Garga, Sâmbavya Suśruta, Vasishṭha, Karâla and Kâpya. Hundreds of times they used to roam about, in company of one another, enquiring into the tastes, properties,<sup>8</sup> forms, powers and names of all medicinal plants.

(Verse 9.) Having observed a *plant* with leaves dark-blue like sapphire, *and* with bulbs white like jasmin, crystal, the white lotus, moon-rays, conch-shell or mica, *and* having his attention aroused *thereby*, 'Suśruta approached the Muni Kâśirâja *with the enquiry*, what it could be. Then that holy man replied to him as follows :

(Verse 10 and 11.) "Of yore the lord of the Asuras himself drank the forth-churned nectar ; his head the holy Janârdana (Vishṇu) cut off. (11.) The pharynx remained attached to the severed head ; *from it* drop fell on the ground, *and* those were its (*garlic's*) first origin.

<sup>8</sup> I propose to read *guṇa* (as in verse 13). The MS. reading *gaya* yields no satisfactory sense. *Guṇa* refers to the five elements : earth, water, fire, air and ether, which are the constituents of all material objects, and after which, according as one or the other predominates in an object, the latter is named. See *Suśruta* I, 41. *Vîrya* or 'power' is that quality by which a drug produces its effect. According to some, *vîrya* is of two kinds : heating and cooling ; others enumerate eight kinds : *ushma* or heating, *śîta* or cooling, *snigdha* or emmollient, *ruksha* or drying, *viśada* or clearing, *pichchhila* or lubricating, *mṛidu* or mild, and *tikshṇa* or sharp. *Rasas* or 'tastes' are said to be five : *madhura* or sweet, *amla* or acid, *kaṭu* or acrid, *tikta* or bitter, *kashāya* or astringent, *lavana* or saline. See *Suśruta* I, 40, 41, 42. The following table shows the reducing effects of the *vîryas* and *rasas* on the three humours according to the *Suśruta* :—

Humour	reduced by vîrya	or rasa.
Wind	<i>ushma, snigdha</i> {	<i>madhura, amla, lavana.</i>
Bile	{ <i>śîta, pichchhila, mṛidu</i>	{ <i>madhura, tikta, kashāya.</i>
Phlegm	{ <i>ushma, ruksha, viśada, tikshṇa</i>	{ <i>kaṭu, tikta, kashāya.</i>

It will be observed that the effects mentioned in verse 15 agree with this table.

## SECOND LEAF: Obverse.

(Verse 12.) Hence Brāhmans do not eat it, because of its having originated from something connected with a living body; its evil smell also the learned in sacred lore declare to be due to the same cause.

(Verse 13.) Because of the absence of salty taste they call it 'Rasūna<sup>9</sup>;' and its designation of 'Laśuna' is well-known among the people. What need to mention the many names by which it is called in the languages of *different* countries? Hear only its tastes, properties, and powers on account of *their importance* for its medicinal use.

(Verse 14.) Its taste, when eaten as well as when digested, is declared to be pungent; but when digested *its taste* is said by others<sup>10</sup> to be sweet; it is of light digestion,<sup>11</sup> *as shown* by its smell, and hot, *as shown* by its blood-invigorating power, and it is famed as an aphrodisiac.

(Verse 15.) By the foremost Munis it has been declared to be, on account of its sour, hot and oily nature, a means of reducing the strength of the windy humour, and,<sup>12</sup> on account of its sweet and bitter nature, also to be, through its juiciness, a means of abating the bilious humour. On account of its hot, sharp, and pungent nature it is said by the learned to be a subduer of the strength of the phlegmatic humour. It was appointed by the Creator a means of removing the *defects of these three humours*<sup>13</sup>, in order that it should kill all diseases.

<sup>9</sup> *Rasūna*, according to popular etymology, derived from *rasa* 'taste' and *āna* 'without', which would properly produce *rasāna*. Or the intended etymology may be from *ra* (for *la*, abbreviation of *lavana*) 'salt' and *sūna* (= *śūnya*) 'destitute of.'

<sup>10</sup> I propose to read *anyaiḥ*. The MS. reading *anyah* yields no satisfactory sense.

<sup>11</sup> Digestion is said to be of two kinds: *guru* or heavy (or brisk) and *laghu* or light (or sluggish). Drugs in which earth and water predominate (see note 8) cause heavy, while drugs in which fire, air and ether predominate, cause light digestion. In the latter urine and faeces are obstructed (*baddha-viṣmātra*), while in heavy digestion they are abundant or loose (*śrīṣṭa-viṣmātra*). Purgative drugs, accordingly, are said to contain an abundance of earth and water, while emetics have more of air and fire. In light digestion the tendency is said to be upwards, in heavy, downwards. See *Suśruta* I, 40, 41.

<sup>12</sup> The following line does not scan in the original, unless *sa* is omitted. I am doubtful as to what is intended to be said. *Sa-rasatanaḥ* might also be read as one word, but would mean the same: 'through its having juice'. Another difficulty is *pitta-bhāva*. There is no taste called *pitta*, so far as I am aware. I have translated 'bitter,' taking *pitta* to be a clerical error for *tikta*.

<sup>13</sup> *Dōsha*, lit. 'defect', is a name for the three humours: *vāta* or *vāyu* or *pavana* 'wind', *pitta* 'bile' and *kapha* or *ślēshman* 'phlegm'. They are called so, because they are (as the Charaka, p. 254, explains) the 'weak points' of the bodily system, inherent in it by nature (*prakṛiti-bhṛita*), but as natural constituent elements of the body, they belong to the supports of the body (*dātṛ-ōpakaraka*), and only become troublesome when they are in a state of derangement (*vikṛita*).

(Verse 16.) It kills also the windy humour when it has got into the bones, and rectifies also the phlegmatic humour when it (*i. e.*, its defect) is not of any long standing; it also greatly stimulates the digestive power, and may be considered an excellent means for restoring vital power<sup>14</sup> and colour.

(Verse 17.) Now by those who want to enjoy in comfort many sorts of liquor, flesh, clarified butter, barley and wheat, the following festival of the garlic is to be observed in the winter season as well as in the months of Madhu and Mādhava.<sup>15</sup>

(Verse 18.) When trimmed girdles, fit for the conquest of men, are given up by the women, and necklaces are not worn by (*lit.*, do not approach) them on account of the cold that distresses their bosoms, and when the husbands do not enjoy themselves on the roofs of the houses of their wives in the full light of the rays of the moon, at that time it should be observed, also when Aguru (fragrant aloe) is highly priced and things coloured with Kumkuma (saffron).

(Verse 19.) Then on the house-tops, gate-ways and upper windows garlands of garlic richly set with its bulbs should be displayed, and on the ground itself one should have worship performed. One should also cause the people of one's household to wear chaplets made of the same (*garlic*). This is the procedure (*for observing the festival*) appointed for the people; it is short, as needed for the lower classes.<sup>16</sup>

(Verse 20—27.) Now the first formula: with a cleaned body and removed from light, after having worshipped the gods, brāhmanas and fire, the patient should drink, on a day marked by an auspicious planet or constellation, of the fresh juice of garlic, strained through a piece of cloth: (21.) either one kuḍava<sup>17</sup> or half a kuḍava or one and a half kuḍava or even more;

<sup>14</sup> On *bala* or 'vital power' see *Saṁskṛta* I, 15. It is the resultant of the seven *dhātus* or 'constituent elements of the body', and is also called *tājas* or *ōjas*. See *verses* 43—45.

<sup>15</sup> That is in spring, of which Madhu or Chaitra (*i. e.*, March—April) and Mādhava or Vaiśākha (April—May) are the two first months.

<sup>16</sup> I am not satisfied as to the correctness of the translation of the last sentence, the original text of which is very obscure.

<sup>17</sup> On this and other measures see Colebrooke's *Essays*, vol. II, p. 533ff. A *kuḍava* is said to be a cubic measure of either  $3\frac{1}{2}$  or 4 fingers (*angula*), holding 2 double handfuls (*prasriti*), a quantity held in both hands by a man of common size). 4 *kuḍavas* make one *prastha*, 4 *prasthas* make one *āḍhaka*, and 4 *āḍhakas* make one *drōṇa* or *kalaśa*; accordingly 64 *kuḍavas* = 16 *prasthas* = 1 *kalaśa*. A *kuḍava* holds 4 *palas*, a *pala* being a 'handful' (*mushṭi*) or half a *prasriti*, or 2 *palas* = 1 *prasriti*. As measures of weight 2 *tôla* make 1 *karsha*, 4 *karsha* = 1 *pala*, 8 *pala* = 1 *śr*, 2 *śr* = 1 *prastha*, 4 *prastha* = 1 *āḍhaka*, 4 *āḍhaka* = 1 *drōṇa*. See Dr. Dutt's *Hindu Mat. Med.*, p. 8.

## (Second Leaf: Reverse).

there is here no fixed measure; let him drink in proportion to the strength of his humours and to his disease.<sup>18</sup> (22.) While it is clarifying, he should slowly blow on it soft currents of air with fans made of palm leaves; and when it boils up or is being spoiled,<sup>19</sup> he should sprinkle it with cold water mixed with powder of sandal. (23.) Of this decoction, fortified by one third part of spirit of rice, he should sip a mouthful,<sup>20</sup> and first stopping a moment to let it play in the throat, he should drink it together with the rest. (24.) When this is digested, he may eat milk with rice; or milk may be taken with the addition of the broth of game or with dainty decoctions of pulses or with oleaginous substances<sup>21</sup>; but he should take these moderately and only once a day. (25.) He may drink mārḍvika, or madhu, or madirā and madhu in equal parts, or arishṭa, or śīdhu, or jagala, or agaja, or mairēya,<sup>22</sup> or whatever other strong liquor there may be; but he should drink these with water, or one at a time, lest there be intoxication. (26.) If he is not used to drinking liquors, he may drink warm water or sour kāñchika; or he may drink tushōdaka or suvīraja,<sup>23</sup> or fresh whey. (27.) He should never take it with treacle, nor should he ever drink unboiled water, while using this prescription; otherwise he will always be in danger of indigestion, nor will he be able to eat properly for a few years.

(Verses 28 and 29.) Now the second formula: Having crushed small fresh bulbs of garlic, and, together with an equal quantity of clarified butter, stirred them well with a churning-stick in a vessel used for clarified butter, one may, after having let the mixture stand for ten days or longer, eat it together with an equal quantity of bel-fruit (*Aegle*

<sup>18</sup> It might also be translated: 'in proportion to the state of his humours, his vital power and his disease.'

<sup>19</sup> Original *murchchhā=pi vatō pi yadi*; I do not know the exact meaning of *rata*.

<sup>20</sup> Original *ganḍūsha*, a term used with gargles; see Dr. Dutt's *Mat. Med.*, p. 18.

<sup>21</sup> *Sndha*, 'oleaginous substance' is said to include the following: *taila* or oil, *ghṛita* or clarified butter, *vasā* or fat, and *majjā* or marrow.

<sup>22</sup> Regarding the identity of these liquors see Dr. Dutt's *Hindu Mat. Med.*, pp. 13, 266, 272, 273, also *Suśruta I*, 45 (transl., pp. 239—243). The only variety that I cannot identify is *agaja*. In the dictionaries it is said to be 'bitumen.'

<sup>23</sup> The *suvīraja* of the text is probably the same as what is called *sauvīra* in *Suśruta I*, 45. All three drinks are kinds of sour gruel, produced by the acetous fermentation of a decoction of different sorts of unhusked grain: *tushōdaka* or *tushāmbu* is made with the husks of a kind of pulse, *suvīraja* or *sauvīra*, with unhusked barley, and *kāñchika* or *kāñjika* or *dhānyāmla* with unhusked rice. On their preparation see *Suśruta I*, 44 (transl., pp. 209, 210, 246); also Dutt's *Mat. Med.*, p. 12.

*marmelos*) ; and when it is digested, one should observe the diet prescribed in the case of the use of the decoction.<sup>24</sup>

(Verse 30.) The two formulas, above set forth by me, are the principal. If thou art not willing to make use of either, hear other formulas from my mouth.

(Verse 31.) *The third formula.* After cleaning bulbs of garlic till they are as bright as a conch shell, they may be eaten with flour of parched grain, kulmāsa and chukra,<sup>25</sup> well cooked with clarified butter and oil, after the manner of broths and meats, accompanied with mashed beans and green vegetables, well seasoned with some aromatic substance<sup>26</sup> and sonchal salt. Or they may be eaten prepared in many other ways. Such others<sup>27</sup> are as follows :

(Verse 32.) *The fourth formula.* Having boiled one and a half bunches of stalks of garlic with meat, one may give this savoury broth to drink, after it has clarified ; one may add to it an equal quantity of boiled milk, either pure or mixed with a decoction of pulse.

(Verse 33.) Now *the fifth formula* : garlic together with oil and śukta<sup>28</sup>, placed in a quantity of barley, should be plastered round with clay and allowed to stand for a year ; a person partaking of this will get rid of diseases even (if of long standing).<sup>29</sup>

(Verse 34.) *The sixth.* If by an apathetic man tugâ (manna of bamboos) is allowed to stand for three nights, then half of it should be caused by that man to be prepared with garlic .....

### Third Leaf: Obverse.

..... curdled milk and clarified butter or also butter-milk ; using this a brâhman may overcome various diseases and become of a sound body.<sup>29</sup>

<sup>24</sup> The *rasa* or decoction is that prescribed in verses 20—27.

<sup>25</sup> Kulmāsa and chukra or śukta are two kinds of sour gruel. As to the latter see Dr. Dutt's Mat. Med., p. 12. See also note 23, above.

<sup>26</sup> Gandha is the name of several aromatic substances : valerian, sandal, myrrh, aloo-wood, camphor, saffron, etc. ; hence the term *gandhāshṭaka* or 'the eight fragrant substances.' I do not know which of these may here be intended, or whether any particular aromatic is intended.—On *sonchal* see Dutt's Mat. Med., p. 85.

<sup>27</sup> I thus translate the *itarāṇi* of the text, supplying *sādhanaṇi*. But I am not sure about the meaning of the phrase. The same phrase occurs in the prose portion after verse 35, below, where *kalpāḥ* may be supplied with *itarāḥ*. Possibly *itarāṇi* is an instance of false concord with *sādhitān* (see introductory remarks), and *śpiṇushva mś* should be understood : "hear from me the following other preparations made in many other ways." The sense remains the same.

<sup>28</sup> This portion is lost in the original. See footnote there

<sup>29</sup> I can make nothing satisfactory of *śmarshmś*. I take it to be connected with



(Verse 35 and Prose.) *The seventh.* Thirty-two prasthas<sup>17</sup> of the juice of garlic, one quarter as much of yeast, one prastha of oil free from all impurity, and six prasthas of flour should be taken. A wise physician will further add one kalāśa of Mēśhaśringī (*Asclepias geminata*) boiled in water, and once more throw in two prasthas of flour. (Prose) This liquor will always, after five days, become ready endowed with taste, colour and aroma; as an oil also it is excellent and most effective. If a person uses it with a purpose, whether as an oil or as a liquor, hosts of powerful diseases will relinquish him. Other formulas are the following:

(Verse 36.) *The eighth.* Having crushed one prastha of cleaned garlic, one should mix it with half a pala<sup>17</sup> of powder of the three myrobalans<sup>30</sup>, and a kuḍava of clarified butter and oil, and then allow it to stand for ten days. This makes an agreeable remedial paste against cough and asthma.

(Verses 37 and 38.) Joined with remedies against wind, garlic cures abdominal tumours caused by the windy humour; and if joined with Khadira (*Acacia catechu*), it at once cures skin diseases. Mixed with Hayagandhā *Physalis flexuosa*, it is a remedy against cough and asthma; and mixed with liquorice, it is declared to be good for the voice. (38) It cures various kinds of diseases, when joined with various kinds of substances. There is no limitation in the way of administering it; for thus was its administration in vogue among the sages.

(Verses 39—41.) Hear from me with an attentive mind, O Śaśrūta, as I set forth briefly its virtues, when applied as an alterative tonic. (40) It cures skin diseases, loss of appetite, abdominal tumours, cough, leanness, and weak digestion. It removes rheumatism, mēnorragia, abdominal pains, consumption, morbid affections of the bowels, enlargement of the spleen, and hæmorrhoids. It banishes hemiplegia, sciatica, worms, iliac passion, and urinary disorders. It cures lassitude, cold of the nose, rheumatism of the arms or back, and epilepsy. (41) Venerable Sir, with a voice beautiful like that of a tabour or flute, with a complexion clear as molten fine gold, strong in memory and mind, with a well-knit body, free from all wrinkles etc., with all your senses steady, collected and constantly increasing in vigour, you shall live for a hundred years, with a well-regulated digestion and inexhaustible virility.

(Verse 42.) Thus far the administration of garlic has been explained by me, even as it was taught by the sages of old, ..... and one should accurately observe it .....

śman 'body.' I may have failed to read it correctly, though the letters seem distinct enough.

<sup>30</sup> I. e., the chebulic, the emblic and the belleric myrobalans. See Dr. Dutt's *Materia Medica*, p. 161.

(Verses 43—45.) Food, digestion, the normal condition of the elements, health, plumpness, spirits, energy and *long* life are *all* dependant on the digestive faculty. (44.) The digestive faculty is set in activity through food; and the resultants of digestion are the elements; health depends on the normal condition of the elements; plumpness on health; (45.) good spirits and energy on plumpness; and through all these the life of living beings is prolonged. Hence one should first of all examine *the state of the digestive faculty*.<sup>31</sup>

(Verse 46—48.) When *the digestive faculty* conduces to the normal condition of the elements, it is said to be (normal or) regular, and this is justly considered its best state. When the digestion is (abnormal or) irregular, one should drink things made of curdled milk or clarified butter or habush and the like; (47.) oily and warm applications<sup>32</sup> also are useful; afterwards food and drink *may be taken*. When the digestion is weak, one should fast at first, and afterwards use medicines to promote appetite and assist digestion<sup>33</sup>; (48.) the use of powders and medicated liquors (arishṭa) also is advantageous as removing defects of the bilious and phlegmatic humours. When the digestion is regular, the physicians should prescribe whatever is agreeable to the system.<sup>34</sup>

Further it may be observed:—

(Verses 49 and 50.) When the digestion is weak or too active, a person dies, unless he receives proper treatment; when it is irregular, all sorts of diseases arise; when it is regular, he lives long in comfort.<sup>35</sup> (50.) Hence a wise physician will at all times in all diseases *first* direct

<sup>31</sup> Compare with this the opening statements in I, 35 and 46 of the *Suśruta*, which appear to inculcate a different view.—According to the *Suśruta* the *dhātus* or 'elements' of the body are seven (see I, 15): *rasa* chyle, *rakta* blood, *māṃsa* flesh, *medas* fat, *asthi* bones, *majjā* marrow, and *śukra* semen.—*Sāmya* or 'equilibrium' is the exact quantity required of each element to constitute a healthy body.

<sup>32</sup> I do not know the exact meaning of the term *vartayaḥ* here. Neither "pill" nor "bougie" seems quite applicable. Perhaps *snigdghōshṇī* should be separated from *vartayaḥ*, and the phrase translated: "oily and warm remedies and *vartis* (whatever the latter may be) are useful."

<sup>33</sup> On *pāchana* and *dīpana* see Dr. Dutt's *Hindu Mat. Med.*, p. 5.

<sup>34</sup> On *sātmya* see *Suśruta* I, 35 (verse 35).

<sup>35</sup> With verses 46—50 should be compared the statements in *Suśruta* I, 35. There four kinds of digestion are enumerated: regular, irregular, weak and too active. These four kinds are referred to in our verse 49. But verses 46—48 mention also a different classification into two kinds only: regular and irregular; and for the latter kind curdled milk and clarified butter are prescribed. But in the *Suśruta* these are prescribed for a too active digestion. Moreover the *Suśruta* prescribes oily (*snigdha*, Dr. Dutt's transl. 'cooling'?), acid and saline remedies for irregular digestion, while our verse 48 prescribes oily and warm remedies.

his treatment to the proper regulation of the digestive faculty, afterwards *paying attention* to the relief of the sickness.

(Verse 51—53.) He who desires a good memory, health and strength, and wishes for a long life, should make use of the fresh juice<sup>36</sup> of the Sankhapushpi (*Canscora decussata*), Brāhmī (*Herpestis Monniera*), Maṇḍūkapaṇṇī (*Hydrocotyle asiatica*) and Madhuka (liquorice). (52.) Within one month he will obtain a good memory, and within twelve months he will be able to reproduce from memory whatever he hears once only, without any decay. (53.) With the same treatment, he will live for a hundred years or for two hundred years, if administered in proportion; and if he goes on continually repeating the treatment, he will enjoy undecaying life.

(Verses 54—58.) In the case of gruels, *khaḍa* (medicated butter-milk), and decoctions; of electuaries, powders (*chūrṇa*) and antidotes; of pills, ointments and suppositories; of fumes and sternutatories; (55) of *pūṭapāka* (roasted drugs), refrigerants, sudorifics, emetics and eye-lotions; and in the case of any other medicaments, not named, when the proportion is not mentioned, (56) the portions of the ingredients should be equal; of honey and clarified butter, there should be a double portion; but of treacle one should take a threefold, and of ground white sugar a fourfold portion. (57) In the case of powders (*pēshya*), when no liquid is prescribed, water should be understood to be taken.<sup>37</sup> In the case of curdled milk, urine, milk, clarified butter, hair, horn and hoof, (58) one should prescribe all these to be taken from the cow, so also in the case of all honeys, to be taken from the common bee.<sup>38</sup>

<sup>36</sup> On *svarasa* see Dutt's Mat. Med., p. 9.

<sup>37</sup> On these medicaments see Dr. Dutt's Mat. Med., p. 9. For a *pūṭapāka* vegetable drugs are made into a paste, and tied up in the form of a ball in leaves of the *Eugenia jambolana* or *Ficus Bengalensis*, after which the ball is covered with a layer of clay and roasted in a cowdung fire. When the clay becomes brick-red, the roasting is completed. The roasted drug is now taken out, and given either in the form of a pill or powder or its juice is expressed and given with honey or other adjuncts.—*Khaḍa* is said to be butter-milk boiled with acid vegetables and spices.

<sup>38</sup> With this compare Sūsruta's directions on honey, and urine in I, 45. He only, says, that the honey of the common bee is the best (*pravaram*), but allows seven other varieties. He makes a similar remark with reference to cow's urine, that it should be used by preference, as being the most effective (*mātra-prayōga-sādhy'shu gāvga-mātram prayajayēt*); but he also permits the use of the urine of other domestic animals. The only reference to other animal substances that I can find occurs at the end of I, 37, where the following are mentioned: blood, hair, nails, milk, urine and fœces; but there is nothing to limit them to products of the cow.

(Verse 59.) With Dâḍima (pomegranate) and Tvacha (cinnamon) one should boil one and a half portion of pungent (Indian mustard) oil<sup>39</sup>: this causes the growth of the ears, and of the female and male genital organs.

(Verses 60—66.) One should boil half a pala of the root of \* Chitraka (*Plumbago zeylanica*), likewise of Trivrit (*Ipomœa turpethum*) and Sâtâlâ (*Stereospermum suaveolens*); (60) and one karsha<sup>47</sup> each of the roots of Dantî (*Baliospermum montanum*) and ....., and likewise of long pepper, rocksalt, asafoetida and sorrel, (61) and fore-most twenty (*karsha*?) of chebulic myrobalan .....

#### Fourth Leaf: Obverse:

From these one should carefully prepare ten boluses with eight pala<sup>47</sup> of treacle, (62.) and take one of them on every tenth day. After it one should drink warm water for the purpose of correcting the defects of the humours; (63.) then, after the purgative has taken effect, one should bathe and may then return to one's ordinary diet.<sup>40</sup> There

<sup>39</sup> I. e., oil of the *Brassica juncea* or *Sinapis ramosa*, largely used by Indians as an article of food as well as an unguent, and known as *kaḍvā* or *karvā tēl* 'pungent oil', as distinguished from *mīthā tēl*, the sweet oil of the *Sesamum indicum*.

<sup>40</sup> Compare with this the formula in *Suśruta* I, 44 (p. 166). There are fewer ingredients and the proportions are different, but the chief ingredients are the same; they are also to be made up in boluses of 8 pala of treacle and one bolus to be taken every tenth day, with warm water after it. It seems also to be the same with the *guḍāśhṭaka* or "eight treacle" formula of the *Bhāvaprakāśa*, quoted in Dr. Dutt's *Mat. Med.*, p. 231. The quantity of treacle is to be equal in weight to the other ingredients. This agrees with the formula in our MS., according to which there are  $\frac{1}{2}$  pala each of Chitraka, Trivrit and Sâtâlâ ( $=1\frac{1}{2}$  pala), one karsha or  $\frac{1}{4}$  pala each of the other 6 ingredients ( $=1\frac{1}{2}$  pala), and 20 karsha or 5 pala of Myrobalan, total 8 pala, equal to the 8 pala of treacle. The *Suśruta* formula, I suspect, is wrongly translated by Dr. Chatterjee (p. 211). It runs as follows: *guḍasy=āshṭa-palā pathyā vimśatīḥ syuḥ palam palam | dantī-chitrakayōḥ karshau pippalī-trivritōr=daśa || kṛtv=aitān=modakān=ēkaṃ daśamē 'hani | tataḥ khādēd=ushnā-tōya-sēvā niryantṛaṇās=tv=imē*. This would seem to mean: "In 8 pala of treacle there should be (mixed), pala for pala, 20 karsha of Pathyā, two karsha (i. e. one karsha each) of Dantī and Chitraka and ten karsha (i. e. 5 karsha each) of Pippalī and Trivrit. Of this mixture make boluses and take one every tenth day, with warm water after it. This is an unlimited remedy." Here the ingredients consist of  $20+2+10$  karsha, i. e.,  $5+\frac{1}{2}+2\frac{1}{2}$  pala, total 8 pala, equal to 8 pala of treacle.—I take *Sâtâlā* to be the *Stereospermum suaveolens*; it is mentioned as a purgative in the second list given in *Suśruta* I, 39, where Dr. Dutt translates it (p. 176) with *Jasminum sambac*. In the third list (p. 177), also of purgatives, however, he translates it with *Stereospermum suaveolens*, and as a synonym of *Pâtâlā* which also occurs in the second list. I may add that in his *Mat. Med.* (p. 190) the *Jasminum sambac* is not described as a purgative drug.

should never be any hesitation with regard to this remedy, either in word or deed or thought. (64.) It is a purgative composed by Agasti, fit for princes, and which can be used in all seasons. It prevents old age and death; it cures all diseases; (65.) it also acts as an aphrodisiac and alterative tonic, and increases memory and health. It should never be administered to any one who has no son nor disciple; (66.) nor should it be given to an enemy of the king, nor to any other sinful liver.

(Verses 67—69.) Both Panchamūla (the five drugs)<sup>41</sup>, Madhuka (liquorice), Guḍūchī (*Tinospora cordifolia*), Rāsnā (*Vanda Roxburghii*), Āsvagandhā (*Withania somnifera*), Dēvadāru (*Pinus deodāra*), Pāṭhā (*Stephania hermaphrodita*), Tvacha (cinnamon), the two Bala<sup>42</sup>, Tagara (*Tabernaemontana coronaria*), and seeds of Tila (sesamum); Mūrvā (*Sansevieria zeylanica*), Kulattha (*Dolichos uniflorus*), Nalada (Indian spikenard) and Ghana<sup>43</sup>; (68.) Punnarnavā (*Boerhaavia diffusa*), and the fruit and bark of Vēṇu (bamboo); Jivanti<sup>44</sup>, also Ēlā (cardamom), Aguru (aloe), and Jivaka<sup>45</sup>; root of Ēraṇḍa (castor-oil plant) together with its fruit and sprouts, flowers of Kurāṇḍa<sup>46</sup>, and Mahaushadha<sup>47</sup>: (69.)

<sup>41</sup> On these *pancha-mūla* or "five drugs" see Dr. Dutt's Hindu Mat. Med., pp. 145, 146. They are distinguished as the lesser (*hrasva*) and the greater (*vrihat*). The former comprise the *Sūlāparṇī* (*Desmodium gangeticum*), *Prīṣṇiparnī* (*Uraria lagopodioides*), *Kaṇṭakārī* (*Solanum Jaquinii*), *Vrihatī* (*Solanum indicum*), and *Gōkshura* (*Tribulus terrestris*). The latter include the *Vilva* (*Aegle marmelos*), *Syōnaka* (*Calosanthus indica*), *Gambhīrī* (*Gmelina arborea*), *Pūfalā* (*Stereospermum suaveolens*), and *Gaṇīkarikā* (*Premna spinosa*). Both sets are together known as the *dāśa-mūla* or 'the ten drugs' or the *dvī-pāñcha-mūlī*.

<sup>42</sup> This is the *Sida*, of which, however, Dr. Dutt in the Hindu Mat. Med., p. 120, mentions four kinds: *cordifolia*, *rhomboides*, *rhombifolia*, and *alba*. The two *Bala* here referred to are probably the *Bala* or *Sida cordifolia* and the *Atibala* or *Sida rhombifolia*. See the 5th list in *Suśruta I*, 39.

<sup>43</sup> The text has *ghana*, which may simply mean 'much', qualifying *Naladam* 'spikenard'; but it seems preferable to take it as the name of a separate drug; it is said to be the same as *Musta* or *Cyperus rotundus*; see the Glossary to the Bibliotheca Indica edition of the *Āsvavaidyaka*.

<sup>44</sup> *Jivanti*=*Caelogyne ovalis*, in Dutt's Mat. Med., p. 301, but according to Watt's Econ. Prod., pt. v, p. 85, it would seem to be the *Cimicifuga foetida*. It is mentioned in the 17th list of *Suśruta I*, 38, where the commentary of Dallana Mishra says that it has a fruit with a milky juice, resembling the fruit of *Latārka*, and that it is popularly known as *Dōḍikā*.

<sup>45</sup> The *Jivaka* is also called *Kūrcha-śīrshaka*, but its identity is no more known. It is one of the drugs which formed part of the group known to the ancients as the *aṣṭa-varga* or 'group of eight drugs.' See *Suśruta I*, 38 (transl., p. 157).

<sup>46</sup> I e., *Corchorus antichorus*, according to Watt's Econ. Prod., pt. v, p. 97, but the dictionaries seem to identify it with *Kurāṇḍa*, which is *Barleria prionitis* according to Watt, *ibid.*, p. 53. See also the 2nd list in *Suśruta I*, 38 (transl., p. 138).

<sup>47</sup> This lit. means 'great drug', and is the name of various plants, such as

two or three of these *drugs* should be boiled in the milk of goats or cows or sheep mixed with water, and then, with the addition of a little rocksalt, the mixture may, in a tepid state, be applied as a lotion in eye diseases caused by the windy humour.<sup>43</sup>

(Verses 70—72.) Dārvi (Indian barberry), Utpala (blue lotus), Padmaka, Tunga, Yāshā, Mēdā, Mrināla<sup>44</sup> (leaf-stalk of the lotus)<sup>45</sup>, Madhuka (liquorice), Samangā (*Mimosa pudica*); Kālyaka (yellow sandal), Parpatāka (*Oldenlandia herbacea*) and Latā<sup>50</sup>, also Drākshā (raisins), Kāshmarya (*Gmelina arborea*) and Parūshaka (*Grewia asiatica*); (71) roots of Gundrā (*Panicum uliginosum*), of Naḍa (*Phragmites karka*) and of Vētasa (*Calamus rotang*), and calyces of flowering grasses<sup>51</sup>; Pra-

ginger, garlic, long pepper, etc. I do not know which of them may be intended here.

<sup>43</sup> In this formula there is a curious mixture of nominative and accusative cases. If the words from *Gudūchi* down to *Tracham* be read as forming one compound, all the names may be taken as accusatives, except *Tilās-cha*, *Jivanti*, *Elā* and *Jivakaś-cha*. The form *Kulatthān*, which is undoubtedly an accusative plural, would show that the whole series is intended to be in the accusative case, with which is to be understood some verb like *dadyāt* or *kalpayēt*, "he should take". *Tilās-cha* is a nominative plural, but might be easily turned into an accusative, by reading *Tilām* (*Tilān*) = *ś-cha*, the omission of the anusvara being a clerical error. But the difficulty cannot be got over in a similar way in the case of *Jivanti*, *Elā* and *Jivakaś-cha*. It is more probable, therefore, that the whole series is intended for nominatives.

<sup>44</sup> *Mrināla* is the leaf-stalk of the true lotus, *Nelumbium speciosum*.—*Tunga* is the name of several things, but is probably here the stamens of the flower of the true lotus, otherwise called *Padma-kēśara* or *Nalina-kēśara* (Sūsruta I, 38, lists 20, 22).—*Padmaka* is said to be "a sort of fragrant wood brought from Malva or Southern India" (Dr. Datt's *Mat. Med.*, p. 312); it is mentioned in lists 17, 19, 25 of Sūsruta I, 38, where the commentary of Dallana Mishra identifies it with *padma-kāśhṭha*; but it appears to be a drug of uncertain identity, and looking to the connection in which the name appears (among other terms referring to the lotus) and to the form of the word itself, it may be suggested that *padmaka* refers to some part of a *padma* or lotus. The root of the *Nymphaea odorata* or sweet-smelling waterlily is used to prepare "a kind of liniment of a cooling and fragrant nature by which the Native Indians sometimes anoint themselves" (W. Ainslie's *Materia Medica of Hindoostan*, p. 118).—*Utpala* is the same as *Nilōtpala* or the blue lotus, *Nymphaea stellata*, a waterlily, but not the true lotus which is the *Nelumbium speciosum*.—The identity of *Mēdā* is no more known; it occurs in the 17th list of Sūsruta I, 38; it is said to be one of the eight drugs constituting the *ashṭa-varga*, see note 45.—*Yāshā* I cannot find anywhere mentioned; perhaps it is the same as *yāśā* or *yavāśā*, generally masc. *yāśa* or *yavāśa*, *Alhagi Maurorum*.

<sup>50</sup> I cannot identify this *Latā*; it is the name of various plants.

<sup>51</sup> Perhaps the "grasses" here referred to are those constituting the *triṇa-sañjñāka* or 'group of five grasses' (Sūsruta I, 38; transl., p. 174). They consist of the *Kuśā* (*Poa cynosuroides*), *Kāśā* (*Saccharum spontaneum*), *Sara* (*Saccharum sara*), *Durbha* (*Imperata cylindrica*) and *Kaṇḍēkshu* (*Saccharum officinarum*). They are

paundarika (root-stock of the lotus) and Kirātatikta ('Chireta' or *Ophelia chirata*), Bhadrāsri (sandal), Nimba (*Azadirachta indica*), Paṭṭola (*Tri-chosanthes dioica*), Vāśā (*Justicia adhatoda*): (72) two or three of these may be boiled in milk of a goat or a woman, and then, with the addition of sugar and honey, will make a very good lotion in eye diseases caused by bile and defects of the blood<sup>53</sup>

(Verses 73—75a.) The three acrids<sup>54</sup>, the three myrobalans<sup>55</sup>, Haridrā (turmeric), Kāsisa (sulphate of iron), Jāti (jasmin), Grihadhūma<sup>56</sup>, Jāti<sup>54</sup>; also Lākshā (lac), Danti (*Baliospermum montanum*), Surasa (Tulsi or *Ocimum sanctum*) and Vachā (*Acorus calamus*); Pāṭhā (*Stephania hernandifolia*), Aśvagandhā (*Withania somnifera*), best Dēvadāru (*Pinus deodara*); (74) also Kaṭphala (*Myrica sapida*), Ēlā (cardamoms), Aguru (aloe), Kaṭṭakārī (*Solanum jacquinii*), Rōdhra (*Symplocos racemosa*), Karañja (*Pongamia glabra*), Vṛinātī (*Solanum indicum*), Śva-damstrā<sup>56</sup>: two or three of these may be boiled in water, and when cooled down to moderate warmth, (75a) they may be used, mixed with rocksalt and honey, as a lotion in eye diseases caused by phlegm: so the sages declare.

(Verses 75b—77a.) Parūshaka (*Grewia asiatica*), Āmrātaka<sup>56</sup> (hog-plum), Tintidika (tamarind), Vṛikshāmla (hog-plum), Jambu (rose-apple), Āmra (mango), Kapittha (wood-apple), Kōla (*jujube*), (76) boiled with liquor of citron or tamarind or pomegranate or with various kinds of milk or with curdled milk or whey; also Dārvi (Indian barberry), Utpalā (blue lotus) and the other above mentioned drugs, boiled with sour substances, make a lotion for the eyes, (77a) which, cooled down to moderate warmth by standing, and mixed with some rocksalt, will thoroughly cure any disease of the eyes caused by defects of the blood.

(Verse 77b—78a.) Having ascertained the exact circumstances<sup>57</sup>

said to remove disorders of the bile. However, according to Dutt's Mat. Med., p. 266, it is the roots of these grasses that are used.

<sup>53</sup> Also called *tryūshana* or *trikaṭu*; they are ginger, black pepper and long pepper.

<sup>54</sup> I cannot identify this plant; I do not find it explained anywhere. Could it be the *Gharikūn* (*Agaricus officinalis* or *ignarius*) mentioned in Dr. Watt's Econ. Prod. of India, pt. v, p. 17?

<sup>55</sup> I do not understand why *jāti* is mentioned twice. It is the name of several plants; but two different plants would hardly be indicated by the same name in the same formula.

<sup>56</sup> According to the Petersburg Dictionary: *Asteracantha longifolia*; according to others: the same as *Gōkshura* or *Tribulus terrestris* (Ainslie, p. 94, Dutt's transl., p. 157).

<sup>57</sup> The text is here mutilated; *Āmrātaka* is the only word that occurs to me as suiting the traces left.

<sup>57</sup> Literally: the less and the more.

of a disease with regard to its being due to a particular assignable cause or its having arisen from the general condition of things<sup>58</sup>, (78a) an intelligent physician should determine *his line of treatment*.

(Verse 78b—79a.) The tender<sup>59</sup> roots of Êraṇḍa (castor-oil plant) with its fruit and sprouts, added to the milk of goats, is an excellent lotion which cures *any disease caused by vitiated* wind and blood : so good physicians declare.

(Verse 79b—80a.) Prapaunḍarika (root-stock of the lotus), Madhuka (liquorice), Haridrâ (turmeric) ....., mixed with sugar, make a lotion which stops any disease due to *vitiated* bile and wind.

(Verse 80b—81a.) Nata<sup>60</sup>, S'vadampstra<sup>61</sup>, Vrihati (*Solanum indicum*), Tvacha (cinnamon) and Hrivêra (*Pavonia odorata*) : these, boiled in goat's milk and water, and mixed with rocksalt, make a lotion which cures *any disease due to vitiated* wind and phlegm.

(Verse 81b—82a.) ..... Dârvî (Indian barberry) and best Madhuka (liquorice), boiled in the milk of a cow or a woman, and mixed with sugar, may be applied by a good physician as a lotion in *any disease due to* wind, blood and bile.

(Verse 82b—83a.) The three myrobalans<sup>60</sup>, finely pulverised and tied up in a piece of white linen and soaked in milk of a goat or a woman or in water, are a remedy in diseases caused by all the humours together.

(Verse 83b—84a.) Dârvî (Indian barberry), Haridrâ (turmeric), the three myrobalans<sup>60</sup>, Musta (*Cyperus rotundus*), mixed with sugar and

<sup>58</sup> I have noticed the term *samsarga-ja* in Snâruta I, 24 (transl. p. 111), where it forms, together with *âkasmika*, the two divisions of the diseases due to *daiva-bala* or preternatural causes. As the commentary explains, these diseases may be due either to an offence against a god or to the curse of a saint or such like, *i. e.*, to some distinct, assignable cause, in which case they are called *samsarga-ja* or 'due to concatenation'; or, on the other hand, they may be due to *karma*, *i. e.*, to some sin committed in a pre-existent life, *i. e.*, practically to no known cause, in which case they are said to be *âkasmika* or 'accidental.' I take *samsarga-ja* to have here this technical meaning: 'due to an assignable cause'; and in contradistinction, I take *sarva-samutthita* to mean 'due to (no particular assignable cause, but) to the general condition of things', to all the surrounding circumstances. I may note, here, that the Snâruta (I, 24) distinguishes between diseases that are *samsarga-ja* and those that are *upasarga-ja*. The former are those that are due to some assignable preternatural cause; the latter are those that are due to an assignable natural cause, *i. e.*, they are such diseases as arise in complication with others, *e. g.*, a disease that arises in complication with fever.

<sup>59</sup> *Vijarjara* is in the smaller Petersburg Dictionary said to mean, "morsch", "mürbe" (rotten, decaying); but it is rather the opposite of *jarjara*, 'old', 'decayed', and therefore means 'young' or 'tender.'

<sup>60</sup> This is said to be the same as *Tagara* (*Tabernaemontana coronaria*).



honey and infused in human milk, make a lotion which is said to be a capital remedy for diseases due to *defects of the bile, blood and wind*.<sup>61</sup>

(Verse 84b—85a.) Young roots and leaves of Ēraṇḍa (castor-oil plant), and paste of Shashtika rice, steeped in clarified butter, and applied by the hand of a young child,<sup>62</sup> is a remedy against the same diseases as mentioned in the case of the preceding prescription.

(Verse 86.) With the same drugs as are prescribed for the lotions, a physician should prepare sudorifics, puṭapākas<sup>63</sup>, sternutatories<sup>64</sup>, refrigerants, potions of clarified butter, plasters and baths.

(Verse 87.) Plasters on the face are declared to be suitable for complaints of the seasons, to remove abhila<sup>65</sup>, freckles and blue-marks, and to be remedies against poisons and swellings.

(Verses 88—91.) (I) Tvach (cinnamon), Kshīrīṇī<sup>64</sup>, also Chandana (sandal) and Padmaka<sup>66</sup>, Gundrā (*Panicum uliginosum*), Mṛṇāla (leaf-stalk of the lotus), also Ghana<sup>63</sup> and Vālaka<sup>65</sup>; (II) roots of Kuśa grass (*Poa cynosuroides*), Tagara (*Tabernaemontana coronaria*), Ēlavālu<sup>66</sup>, leaves of Tālisa (*Pinus Webbiana*), Nalada (Indian spikenard) and Tila (sesamum) seeds; (89.) (III) Masūra (*Vicia lens*), Durvā (*Cynodon dactylon*), Ama-yava (uncooked barley), Mṛṇāla (leaf-stalk of the lotus) and juice of Yashtīmadhuka (liquorice) and Utpala (lotus); (IV) Sāilēya<sup>67</sup>, Musta (*Cyperus rotundus*), Aguru (aloe), and Jhāmaka<sup>68</sup>, Sthaupēyaka<sup>69</sup>, Ēlā (cardamoms),

<sup>61</sup> Verse 84a is found, word for word, in the Vangasēna, on eye diseases, p. 788.

<sup>62</sup> Or perhaps: 'by a dead hand', by the hand of a corpse. I do not understand the direction.

<sup>63</sup> Nāvana or nāvana is given in the smaller Petersburg Dictionary, as meaning 'sternutatory.' I have met with the word in the Vangasēna, p. 789, in a similar juxtaposition with tarpaṇa and āśchyōtana. A tarpaṇa is a refrigerant drink made of flour of parched grain mixed with water.

<sup>64</sup> The reading seems to be corrupt. I cannot find a drug Kshīrīṇī. There is Kshīrīṇī which is the name of several plants. There is also Tvakkshīrā a name of Tugā or Tabashir.

<sup>65</sup> Apparently the same as Bālaka (*Sida cordifolia*), mentioned in the 11th list of Susruta I, 38 (transl., p. 164).

<sup>66</sup> Ēlavālu is now unknown. It is mentioned as Ēlavālu in the 6th list of Susruta I, 38 (transl., p. 161), where Dallana Mishra's commentary explains it as a reddish powder (*hari-vālu*), resembling that of the seeds of the *Kṛishṇagandhā* (*Kṛishṇagandhikaphala*). The latter is the same as the *Sigru* or *Sōbhānjana* (*Moringa pterygosperma*), of which there exists a red variety (Dutt's Mat. Med., p. 118).

<sup>67</sup> I cannot identify this. It is said to be the same as *Tālaparṇī* (*Anethum graveolens*); also a kind of lichen (Dutt's Mat. Med., p. 315); also several kinds of minerals. Here some plant is probably intended.

<sup>68</sup> Jhāmaka is probably the same as (*i. e.*, a prakritized form of) *Dhyāmaka*, which is mentioned in the 11th list of Susruta I, 38, where Dallana Mishra's commentary identifies it with *Katṛiṇa*, popularly called *Rōhish*. The latter is said to be "a fragrant grass" (Dutt's Mat. Med., p. 304), but its identity appears to be unknown.

<sup>69</sup> I cannot identify this. It occurs in the 11th list of Susruta I, 38, where

Tagara (*Tabernaemontana coronaria*), and Tila (sesamum) seeds; (90). (V) Tvak-patra (bark and leaves of cinnamon), Kushṭha (*Saussurea auriculata*), Aguru (aloe), and Jhāmaka<sup>69</sup>, Māmsi (*Nardostachys Jatamansi*), Harēṇu (*Piper aurantiacum*) and Paripēlava<sup>70</sup>; (VI) Yashtihva (liquorice), Rôdhra (*Symplocos racemosa*), Aguru (aloe) and Chandana (sandal), Punarnavā (*Boerhaavia diffusa*), black Tila (sesamum) seeds and Latā<sup>50</sup>: (91.) the six face-plasters, severally described in the foregoing half-verses as beneficial to the eyes of the people, should be applied in the summer and the other seasons, according as they remove in them the defects of the humours. Now listen to me as I explain this.

(Verse 92.) In the rainy season they are said to cure diseases due to *derangement* of the wind; in the autumn they are held to cure diseases due to *derangement* of the bile; in the summer they are held to cure diseases due to *derangement* of the blood; in the spring they are said to cure diseases due to *derangement* of the phlegm.<sup>71</sup>

(Verses 93—94.) Roots of Karpāsa (cotton-plant), Alatā, Uśira (*Andropogon muricatus*), Kāliyaka (yellow sandal), and the bark of plants with a milky sap, Bhadrāśrī (white sandal), ....., Yava (barley-corns): these are said to make plasters for the face beneficial to the complexion. (94.) These should be dried and then mixed with the urine of a cow, or with Kôla (jujube), tamarind and urine, or they may be dried and mixed with the juice of Mātulunga (citron) and mustard, (and thus applied to the face).<sup>72</sup>

#### Fifth Leaf: Obverse.

(Verse 95.) ..... if the blood becomes painful or vitiated or emitted, face-plasters should be applied, at the same time that some

Dallana Mishra's commentary explains it by *Ghunēra*, and Dr. Dutt translates it (p. 164) by "a sort of gall caused by an insect." The smaller Petersburg Dictionary, however, makes it to be "a kind of aromatic plant." Its identity would seem to be now unknown.

<sup>70</sup> I cannot identify this. The smaller Petersburg Dictionary says it is some plant allied to the *Cyperus rotundus*, which is the *Musta*.

<sup>71</sup> With this compare Susruta's statements in Sūtrasthāna, chapt. 6 (p. 20, transl., p. 27). There six seasons are mentioned, each consisting of two months. The six seasons form three sets: 1, late rains and autumn, 2, winter and spring, 3 summer and early rains. Diseases due to bile arise and come to a head in the late rains and autumn, and are relieved in the winter (in our MS., in the autumn); diseases due to phlegm arise and come to a head in the winter and spring, and are relieved in the summer (in our MS. in spring); diseases due to wind arise and come to a head in the summer and early rains, and are relieved in the late rains (in our MS. in the rainy season). Disease due to deranged blood are not referred to at all in the Susruta.

<sup>72</sup> I do not quite understand this formula: Alatā I cannot identify; nor do I know whether *āmbā* 'tamarind', or *ambla* 'sorrel', or *amla* 'vinegar' is intended.

oleaginous substance is given as a purgative and various secretories administered to the nose.<sup>73</sup>

(Verse 96.) Tvak-patra (bark and leaves of cinnamon), Māṃsī (*Nardostachys jatamansi*), Nata<sup>60</sup> and Chandana (white sandal), Manahśilā (realgar), Vyāghranakha<sup>74</sup>, Harṇu (*Piper aurantiacum*); Āmbā (tamarind ?), Kushṭha (*Saussurea auriculata*), the two Surasā (Tulsi-plant), and the two Haridrā (turmeric)<sup>75</sup>, applied as a face-plaster, act as remedies against poison.

(Verse 97a.) Mūrvā (*Sansevieria zeylanica*), Āsvagandhā (*Physalis flexuosa*), the three Myrobalans<sup>80</sup>, Karañja (*Pongamia glabra*), applied as a face-plaster, act as a remedy against dropsy.

(Verse 97b.) Mūrvā, mixed with cow's urine, and applied as a face-plaster, is said to be a remedy against dropsy.

(Verse 98.) While a plaster is applied to the face of a patient, he should not laugh, nor weep, nor enjoy sleep, nor should he eat. Nor should he warm himself at a fire, nor let the plaster become dry.

(Verse 99.) Abhīlu and nilikā<sup>76</sup>, moreover skin-diseases, freckles, and suppurating<sup>77</sup> eruptions of a person are instantly cured, and the eye and face relieved, through the application of a face-plaster.

(Verse 100.) If one laughs or cats while a plaster is applied to his face, his phlegm as well as his wind will be deranged, and if he sleeps, they will quickly grow to excess: in such a case secretories should be applied to the head, oleaginous substances also should be administered and fumes inhaled.<sup>78</sup>

<sup>73</sup> See note 78.

<sup>74</sup> Vyāghranakha is mentioned in the eleventh group of drugs in the Sūśruta I, 38, p. 141. Dr. Dutt, in his translation (p. 164), says that it is "a fragrant substance like a nail, the operculum of *Parpura* and *Murex*." Dallana Mishra's commentary (p. 309) identifies it with *Vrihannakha* or *Vrihannakhi*.

<sup>75</sup> On the two *Surasā* (*Ocimum sanctum*) see Dallana Mishra's commentary to Sūśruta I, 38 (8th list); also Dutt's Mat. Med., p. 219. They are the white and black varieties of the Tulsi-plant. On the two *Haridrā* (*Curcuma longa*) see Dutt's Mat. Med., p. 256: "The term *haridra-dvā*, or the two Turmeric, signifies turmeric and the wood of *Berberis Asiatica*. They are often used together ..., and their properties are said to be analogous."

<sup>76</sup> *Abhīlu* and *nilikā* I cannot find in any dictionary. As the remedy is both for the eyes and the face, they would seem to denote two different kinds of eye-diseases, while the following group comprises various kinds of skin-diseases of the face.

<sup>77</sup> This is conjectural; the MS. has *sa-pilpā* or perhaps *sa-pilpam*. I cannot find the word *pilpa* noticed in any Sanskrit dictionary. Hindī has a word *pīp* or *pīb* meaning 'suppuration', 'pus', and a verb *pībiyānā* 'to suppurate'. *Pīp* might go back to a Prākṛit form *pīppa*, and this to Sanskrit *pīlpa*.

<sup>78</sup> The *śirasā virēka* or *śiro-virēchana*, 'secretory applied to the head' is one of the *nāśya* or applications of medicated substances to the nose. Its object is to cause

(Verse 101.) If through the heat of a fire the face-plaster of a patient has melted, or if he has allowed it to become dry, then *abhilu*<sup>78</sup> and the other above mentioned diseases are said to *break out*. These should be relieved in the manner above explained.

(Verse 102.) Night-blindness, dimness of the eyes, inflammation of the head, inflammation of the eyes caused by deranged bile, moreover any other evils affecting the skin of the face, are instantly relieved through the application of a face-plaster.

(Verse 103.) In the case of any disorder of the eyes due to *derangement* of the phlegm and wind, in the case of the application of a secretory to the nose<sup>78</sup> of people suffering from catarrh, in the case of lock-jaw, and in the case of diseases of the head, it is said that face-plasters should be avoided.

(Verse 104.) A face-plaster should be made of the thickness of a quarter *aṅgula*; the middle sort should have the thickness of a third of an *aṅgula*, and the thickest should measure (half an *aṅgula* ?)<sup>79</sup>.

(Verses 105—107.) (I) Liquorice, Rôdhra (*Symplocos racemosa*), the three myrobalans<sup>80</sup>, leaf-stalk of the lotus, candied sugar, Kāñchana (*Bauhinia variegata*), and red ochre; (II) Leaves and bark of cinnamon, cardamoms, aloe-wood, Deodar, Punarnavâ (*Boerhaavia diffusa*), Vyāghraṇa-khâ<sup>74</sup>, and galena; (106)(III) Realgar, orpiment, Vṛihatî (*Solanum indicum*), and cinnamon, Māṃsî (*Nardostachys jatamansi*), Harêṇu (*Piper aurantiacum*), and Paripêlava<sup>70</sup>; (IV) Galena, red ochre, Katphala (*Myrica sepida*), and Śarivâ<sup>80</sup> mixed with sugar: (107.) the four mixtures, severally described in the foregoing half-verses, relieve diseases caused by the *derangement* of phlegm, blood, bile and wind; or they may be applied externally as pastes all about the eye up to the roots of the eye-lashes.

(Verse 108.) Rôdhra (*Symplocos racemosa*), iron smeared with a little clarified butter and finely powdered, or chebulic myrobalan, cinna-

a flow of secretion from the nose and thus to relieve cerebral congestion. Medicated oils applied for a similar purpose are called *Vṛiṇhana*. In affections of the head, eyes or nose, the fumes are drawn in through the nose. See Dr. Dutt's Hindu Mat. Med., pp. 17 and 20.

<sup>79</sup> This verse occurs, almost verbally the same, in the Vaṅgasēna, in the chapter on the treatment of minor diseases (*kshudra-rôga*), p. 715, verse 44. Its second half-line there runs thus: *madhyamas=tu tri-bhāgaḥ syād=uttamo=rdh-aṅgulô bhavêt*. There is also a warning given there against putting on or keeping on dry plasters, corresponding to verse 101 of our manuscript.—An 'aṅgula' is  $\frac{1}{2}$  inches or 2 centimeters. The thickness of the ordinary plaster accordingly should be  $\frac{1}{8}$  of an inch or  $\frac{1}{2}$  centimetre; that of the thickest would be  $\frac{1}{4}$  of an inch or 1 centimeter.

<sup>80</sup> There are two different plants called by this name. Here the *Ichnocarpus frutescens* is probably intended; see Dr. Dutt's Hindu Mat. Med., p. 196.

mon, an equal quantity of Vṛihati (*Solanum indicum*) and galena, made into a paste, may be used as a remedy in all diseases.

(Verse 109.) Red ochre, rasôt,<sup>81</sup> galena, realgar, calx of brass in equal parts, mixed with a little black pepper, a double portion of .....

†

#### Fifth Leave: Reverse.

(Verse 110.) With pepper and calx one should boil Harita<sup>82</sup> on a slow fire together with clarified butter. This will make an ointment and paste for the eyelids.<sup>83</sup>

(Verse 111.) Listen to (the treatment of the hair and its diseases) as it is being explained by me .....

(Verse 112.) Derangement of the chyle, indulgence in sexual intercourse, and vitiation of the bile and blood cause premature grey hair, and in the cause of an old man it is due to old age.

(Verses 113—115.) The constitution of a woman is generally phlegmatic; lying ..... enjoying, they discharge the vitiated menstrual blood. (114) Hence their scalp becomes relieved of the heat of their blood and bile, and thus they do not loose their hair, and therefore women are not bald-headed. (115) On the contrary the blood and bile of men become vitiated; (this destroys) the roots of their hair, and the head becomes bald.

(Verse 116.) Baldness, consisting in the entire loss of hair or in its becoming copper-coloured, if it is long established on the head, cannot be removed. But if it is of recent origin, it may be remedied and should be carefully attended to.<sup>84</sup>

<sup>81</sup> On *rasôt* or *rasāñjana*, an extract of *Berberis Asiatica*, see Dr. Dutt's Hindu Mat. Med., p. 107.

<sup>82</sup> *Harita* is the name of gold, also of several plants, especially *Phaseolus mungo*. I do not know what may here be intended.

<sup>83</sup> On *vidālaka* see Dutt's Hindu Mat. Med., p. 18.

<sup>84</sup> Compare the Charaka, p. 798, where also three defects of the hair are mentioned: *khālitya* 'baldness', *palita* 'grey hair', and *hari-lōman* 'red hair.' The latter corresponds to the *tāmra-bala* of our MS., and is called *indra-lupta* in the *Suśruta* and *Vangasēna*. The latter two works have identical remarks on the subject; see *Suśruta* II, 13 (p. 288, verses 209, 30) and *Vangasēna*, p. 724 (verses 134, 135). They call the three diseases *indra-lupta*, *khālitya* and *palita*, and explain the former two kinds as two forms of loss of hair (*prachyāvati rōmāni*), and *palita* as making the hair grey (*kṣēṇa pachati*). I imagine the disease, intended by *tāmra-bala*, to be the "scald-head" (*Porriga declavans*), which causes the formation of a yellowish or reddish scurf on the scalp and a partial loss of hair.

(Verses 117—119.) In the case of baldness or grey hair one should in the first place have frequent recourse to blood-letting; the application of emetics *also* is advantageous for the purification of the vitiated blood; (118.) afterwards, when the stomach is clear, (suitable food) should be taken. Also different kinds of oil and hair-colouring substances should be applied, (119.) and also drugs that cause the production and growth of hair. *Frequent washings of the hair too are beneficial, because they remove what is injurious to them.*

(Verse 120.) A wise physician should administer clarified butter, mixed with sweet, sour and salty substances, to a patient suffering from cough caused by *derangement of the wind*, either in his food or by itself, according to the state of his vital power.

(Verses 121 and 122.) Wheat and rice may be eaten, with the broth of the flesh of water-animals, marsh-animals or domestic animals, and with treacle and onions and *any other* sour, oleaginous, pungent or sweet things<sup>85</sup>. (122.) Spirit of rice with cream, or warm water and syrup may be drunk at will, when one is suffering from wind and cough, *also* plenty of oleaginous substances with treacle, or milk.

(Verse 123.) An electuary prepared from ginger, Shaḍi (*Curcuma zedoaria*), raisins, Śringī (*Rhus succedanea*), long pepper and Bhārgī (*Clerodendron siphonanthus*), mixed with treacle and *sweet oil*, is beneficial to sufferers from cough caused by *derangement of the wind*.<sup>86</sup>

<sup>85</sup> A similar direction occurs in the Charaka, p. 735 (bottom), and in the Chakradatta, p. 210, No. 1. The latter explains that by the *grāmya* or domestic animals are meant such as the cock (*kukkūṭa*), by the *ānūpa* or marsh animals, such as the hog (*śūkara*), by the *udaka* or water-animals, such as the turtle (*kachchhapa*). This does not, however, seem to quite agree with the classification of the Sūśruta. That work (p. 198, transl. p. 259) divides the animals into 6 classes: *jālā-śūya* (water), *ānūpa* (marsh), *grāmya* (domestic), *kravya-bhujā* (carnivorous), *eka-saptha* (one-hoofed), *jāṅgala* (wild). Of these the three first-named classes are those mentioned in our MS. The Sūśruta adds another division into only two classes: the *jāṅgala*, including the four last-named of the above six classes, and the *ānūpa*, comprising the two first-named. The *jāṅgala* class of this second division is subdivided into 8 sub-classes, among which there is a *vishkira* (bird) and also a *grāmya* sub-class. Here the cock (*kukkūṭa*) does not belong to the *grāmya*, but to the *vishkira*; but perhaps in the original classification into 6 classes, it would have been counted among the *grāmya*. To the *grāmya*, as a sub-class, belong only quadrupeds, such as the horse, cow, goat, sheep, etc. The *ānūpa* class of the second division has 5 sub-classes, among which there is a *kāla-chara* (shore-walker) and a *kośa-sṭha* (sheath-clad) sub-class. To the former belongs the hog (*varāha* or *śūkara*), to the latter, the turtle (*kārma* or *kachchhapa*). Herein the Chakradatta agrees with the Sūśruta.

<sup>86</sup> The identical formula occurs in the Vaegasēna, p. 260, verse 14, and is quoted in the Chakradatta, p. 210, No. 2, (Dutt's Mat. Med., p. 140). But in these works, the first half-line is differently arranged and runs as follows: *Bhārgī drākṣhā*

(Verse 124.) A powder made of long pepper, *Māruta*, *Ajāḷi* (*Nigella sativa*), *Shaḍi* (*Curcuma zedoaria*), *Pushkara* and *Chitraka* (*Plumbago zeylanica*), and mixed with rocksalt, is beneficial to sufferers from cough due to *derangement* of the wind.<sup>87</sup>

(Verses 125—127.) One should boil thirty pala<sup>17</sup> of *Kañṭakāri* (*Solanum jacquinii*) in one āḍhaka of water, till it has been reduced to one-fourth of its quantity; and when it has clarified, one should add an equal number of palas of treacle in a waterjar: (126.) then with powders of *Nāgara* (dry ginger), *Bhārgi* (*Rhus succedanea*), cardamoms, long pepper, *Shaḍi* (*Curcuma zedoaria*) and *Chitraka* (plumbago), and with four palas of clarified butter and sweet oil, one should boil it, (127.) till it attains to the consistency of an electuary, and when it has become cold, one should add two palas of honey and one pala of powdered long pepper, and then lick it as a remedy against cough.<sup>88</sup>

(Verse 128.) One should boil a paste of *Bhārgi* (*Rhus succedanea*) and clarified butter with an infusion of the *Daśamūla* (or Ten-drugs) [in the broth of a cock or a partridge]. This is an excellent remedy against cough due to *derangement* of the wind.<sup>89</sup>

*śaṭṭ śringṭ pippalṭ vishvabhēshajaiḥ*. Somewhat similar formulas are those of the *Vaṅgasēna*, p. 260, No. 13 and p. 261, No. 15, and those of the *Charaka* on p. 733 (bottom), commencing with *durālabhām* and *duḥsparsām*. In fact *Vaṅgasēna* No. 15 is identical with the *Charaka's* *durālabhām*, etc.—The drug, called *shaḍi* in our MS., appears to be the same as what is usually called *śaṭṭ*.

<sup>87</sup> This formula I have not been able to trace anywhere else. Two of its ingredients I cannot identify. *Māruta* would seem to be the same as *Kaṭphala* (see *Watt's Economic Prod.*, pt. v, p. 188), the S. Indian name of which is *Marutamtol* or *Marudampatai*. *Pushkara* appears to be unknown at the present day. See *Dr. Dutt's Hindu Mat. Med.*, p. 314, who says: "this root is not available; the root of *Aplotaxis auriculata* (*Kushṭha*) is substituted for it. See, however, *Watt's Econ. Prod.*, pt. v, p. 232, *Saussurea Lappa*. *Ajāḷi* is the same as *kāḷājāṭi* or *kṛishṇa-jiraka*.

<sup>88</sup> With this formula may be compared a somewhat similar, though much shorter one, in the *Charaka*, p. 732, which is quoted in the *Chakradatta*, p. 219, No. 77. It runs as follows: *kañṭakāri-guḍācātibhyāṃ prithak triṃśat-palād=rasē* ! *prasthaḥ siddhō ghrītād=vāta-kāsa-nud=vahni-dīpanaḥ*.

<sup>89</sup> This formula is found, verbally the same, in the *Vaṅgasēna*, p. 261, verse 16, where it is called the "*daśa-mūlādyāṃ ghrītam*." It is also quoted in the *Chakradatta*, p. 216, No. 70. The only difference is, that these two works read *daśamūlī-kashāyēṇa*. According to the *Charaka*, p. 20, there are five kinds of *kashāya* or 'extracts': 1, the *svarasa* or the 'simple juice' squeezed out of some substance; 2, *kalka* or a 'paste' made of a pounded substance and its juice; 3, *śrīta* or the 'decoction' of a substance; 4, *śīta* or a 'cold infusion', obtained by allowing a substance to soak for a night; 5, *phaṇṣa* or 'hot infusion', obtained by throwing a substance into hot water and squeezing it. See also *Dutt's Mat. Med.*, pp. 9, 10. From the wording of the formula it is not clear which kind of *kashāya* is here intended; but the commentary in the *Chakradatta* interprets it as being the *śrīta* or *kvātha*, i. e., a decoction over fire.

(Verse 129.) In a prastha of the juice of Kaṇṭakāri (*Solanum jacquinii*) one should boil a kuḍava<sup>17</sup> of clarified butter with a paste of Punarnavā (*Boerhaavia diffusa*). This is an excellent remedy against cough due to *derangement* of the wind.

(Verse 130.) One should boil a paste of Bhārgī (*Rhus succedanea*) and clarified butter, mixed with an equal quantity of the juice of Vyāghrī (*Solanum jacquinii*)<sup>90</sup>, in four parts of curdled milk. This makes an excellent remedy for cough due to *derangement* of the wind.<sup>91</sup>

(Verse 131a.) In the case of a bilious cough the drinking of clarified butter together with the use of purgatives is beneficial.

<sup>90</sup> *Vyāghrī* is another name of *Kaṇṭakāri*; see e. g., the formula No. 3, on p. 220 of Dutt's *Mat. Med.*

<sup>91</sup> This formula is found, verbally the same, in the *Vaṅgasēna*, p. 261, verse 17, where it is called the "*bhārgy-ādi-ghṛita*." The second half-line reads here *bhārgy-rasam dviguṇitam*, but this is certain to be a false reading for *vyāghrī-rasam*, as the *bhārgy* is already included in the first part of the formula. The traces '*vdghṛ*' are quite distinct in our MS. The phrase *vyāghrī-rasa-dviguṇitam*, lit. 'doubled by the juice of Vyāghrī', I take to mean "Vyāghrī juice equal in quantity to the other two ingredients"; but it might also mean "two parts of Vyāghrī"; and this latter would be the only meaning of the reading (*rasam*) in the *Vaṅgasēna*. Practically, however, it makes no difference, whichever translation is adopted.





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- No. I.—Containing pp. 1—140, with Plate I, was issued on May 19th, 1891.
- No. II.—Containing pp. 141—210, with Plates II and III, was issued on July 16th, 1891.
- No. III.—Containing pp. 211—282, with Pls. IV, V and VI, was issued on September 28th, 1891.
- No. IV.—Containing pp. 283—414, was issued on March 12th, 1892.



## LIST OF PLATES.

- I New oriental Butterflies (Doherty).
- II Butterflies of Sumba and Sumbawa (Doherty).
- III *Nepeta Bellevii* (Prain).
- IV } Uredinæ from Simla (Barclay).
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- VI New Indian Snakes (Selater).





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# JOURNAL

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### Part II.—NATURAL SCIENCE.

No. I.—1891.



I.—On certain *Spiders which mimic Ants*.—By SURGEON J. H. TULL  
WALSH, I. M. S.

[Received 25th February ; read 4th March.]

Whoever has studied the structure and habits of the various genera of the *Formicidæ* must have been struck by the “fitness” which these little creatures possess for “the struggle for existence.” Even in those individuals with a rudimentary and useless sting there are still the powerful biting mandibles, the acid poison which can be ejected, often to a considerable distance, on to the enemy and various protective odours, such as those secreted by the anal glands of most of the *Dolichoderidæ*. The pangolin and other ant-eaters certainly cause havoc among the ants who make their dwellings in the ground, but smaller animals and birds cannot attack ants with impunity, and it is noticeable that the ants most frequently mimicked live and feed on trees. Such being the case the ant is well protected, and any other creature that, by an accident of natural selection, resembled an ant in form and colour would have obtained an advantage through this resemblance, all unconscious as regards the individual but conscious, if one may use such an expression, in relation to the orderly complexity of nature. The advantageous resemblance would, according to generally accepted laws, be transmitted and strengthened until the mimic reaped the full benefit accruing from its likeness to the ants among which it lived. Such instances of mimicry are seen among a certain sub-family of spiders,



the *Attidæ*. These spiders, ant-like in form, and partially ant-like in habit, do not spin webs for the purpose of catching prey, but, wandering about in company with the ants they resemble, spring upon their victims from behind, (hence called by some Entomologists *Saltigradæ*). Their home is generally fixed to the under surface of a leaf and consists of a small oval, whitish, silky nest just big enough to accommodate the spider. Attention has been drawn to the presence of these spiders in America\* and Africa†; Mr. Wood-Mason collected two or three specimens in Assam some years ago and Mr. Rothney‡ notes the occurrence of a *Salticus* in company with *Sima rufo-nigra* in the neighbourhood of Barrackpur. I have found these spider mimics in Orissa, and also in and near Calcutta, and have, during the last eighteen months, collected or acquired some eight or ten species or varieties belonging to genera of the sub-family *Attidæ*. With one or two exceptions all these spiders were found hunting with the ants they so closely resemble. The two most common are a variety of *Salticus formicarius* Linn. which mimics *Sima rufo-nigra* Jerd. and a pretty *Salticus* (sp. ?) which may be found in company with *Ocophylla smaragdina* Fabr. whose nests are extremely common on the trees in the Royal Botanic Gardens at Sibpur.

The resemblance in form and colour is so great that collectors have been deceived, and indeed except with a lens it is difficult often to say which is the ant and which is the spider; but at the same time it must be remembered that the likeness is greater when both are alive and moving than when the dead spider is compared with the dead ant. While the body in most sub-families of spiders is short and rounded with a constriction only between the cephalothorax and the abdomen, the mimic has a long thin body like that of an ant. There is a partial constriction marking off the cephalic from the thoracic portion of the cephalothorax, and that part of the spider's body which joins the cephalothorax to the abdomen is drawn out into a pedicle having on its upper surface nodes mimicking closely those on a ant's pedicle. The colouring of the spider is also a more or less correct imitation of that of the ant. A superficial resemblance could hardly go farther, but there is a still more wonderful point to notice. The spider has four pair of legs and no antennæ; the ant has three pair of legs and a pair of long an-

\* Bates, Trans. Linn. Soc. Vol. XXIII.

Belt "Naturalist in Nicaragua," p. 314.

Peckham "Protective Resemblances in Spiders." I have not been able to read this in the original and know of it only from references found in Poulton's "The Colours of Animals."

† J. P. Mansel Weale Nature Vol. iii. p. 508.

‡ Jour. Bomb. Nat. Hist. Soc. Vol. V, p. 44.

tennæ which are generally kept in motion as the little animal runs along. In adapting themselves to circumstances, the spiders have learned to use their first pair of legs to represent antennæ. In all the cases that I have noticed, the spider when moving holds its first pair of legs aloft to simulate antennæ, and certainly in the case of a *Salticus* (sp. ?) which mimics *Camponotus micans* Mayr these legs are kept in continual motion. On one of the bottles presented to me by Mr. J. Wood-Mason I find the following note made at the time the spiders were captured:—

“(Cachar, J. W.-M.) smaller one mimics and runs about with a little brown ant carrying its palpi like the open mandibles of the ants, and its first pair of legs off the ground and elbowed, as the ants do their antennæ.”

This note draws attention to another curious resemblance which is produced by the flattening of the terminal joint of the palpi. In the spider found by Mr. Wood-Mason and in several other species, this formation occurs and the falces, which are small, are partly hidden by the palpi. In other species and notably in *Salticus formicarius* the palpi are small and the resemblance to mandibles is produced by the large flattened first joint of the falces; thus the same end, as far as the resulting mimicry is concerned, is attained by two very different morphological variations. Belt (*l. c.*) notices the fact that in the Nicaraguan species the fore-legs are raised from the ground and J. P. Mansel Weale (*l. c.*) makes some interesting remarks which I will quote. He says:—

“The most perfect cases of mimicry I know of are two spiders (specific nature unknown to me) which have the closest resemblance to ants. They belong to the *Salticidæ* and are apparently related to *Salticus formicarius*. The one is smooth black and shining and runs rapidly on the ground and bark of trees, and resembles the ant which builds its nest in *Acacia horrida* and is used by the Kafirs for the purposes of torture. The other is larger and has its cephalothorax dull black and its abdomen covered with short yellowish hairs. It is generally found running on the stems of herbaceous plants and small bushes and closely resembles an ant found in similar situations. The fore-legs in both species are larger than the second pair are frequently held up when they closely resemble the antennæ of ants.”

As a general rule therefore most observers agree that the first pair of legs is used to simulate antennæ, but an exception must be noted. E. G. Peckham (*l. c.*) records that an American species *Synageles picata* “holds up its second pair of legs to represent antennæ.” This peculiarity of habit has apparently produced or been produced by a change in the relative length of the legs in this species. The general

formula for the *Attidæ* seems to be 4, 1, 3, 2; the fourth pair of legs being the longest and the second pair the shortest. In *Synageles picata* the formula, to judge from a figure (*l. c.*), is 4, 2, 3, 1. *Synemosyna formica*, another American spider observed by Peckham, has the usual formula, but is said to use its second pair of legs as antennæ!

I have mentioned that the spiders are probably protected from birds and other enemies by their resemblance to ants, but there can be no doubt that frequently they also thereby gain another very considerable advantage. The ants with which these spiders "most do congregate" are fairly omnivorous feeders, but shew a decided preference for sweet juices often to be found exuding from trees, fruit or flowers. To these juices come also flies, small beetles and other insects which form the natural prey of the spider, and which do not, under the circumstances, particularly fear the ants. Thus while the flies are sucking up sweetness in company with the ants, the spider is no doubt able, under cover of his disguise, to approach near enough to make a spring upon his unsuspecting victim and fix his sharp falces into its body. As regards the ants themselves, they do not seem to take any particular notice of the spiders, and do not apparently attack them. One spider, a mimic of *Ocophylla smaragdina* was found by me in a nest of these ants with its little silky shelter attached to one of the leaves which formed part of the abode of probably the most fierce of all the ants found in Bengal. It may also be supposed that the spider does not attack or annoy the ants.

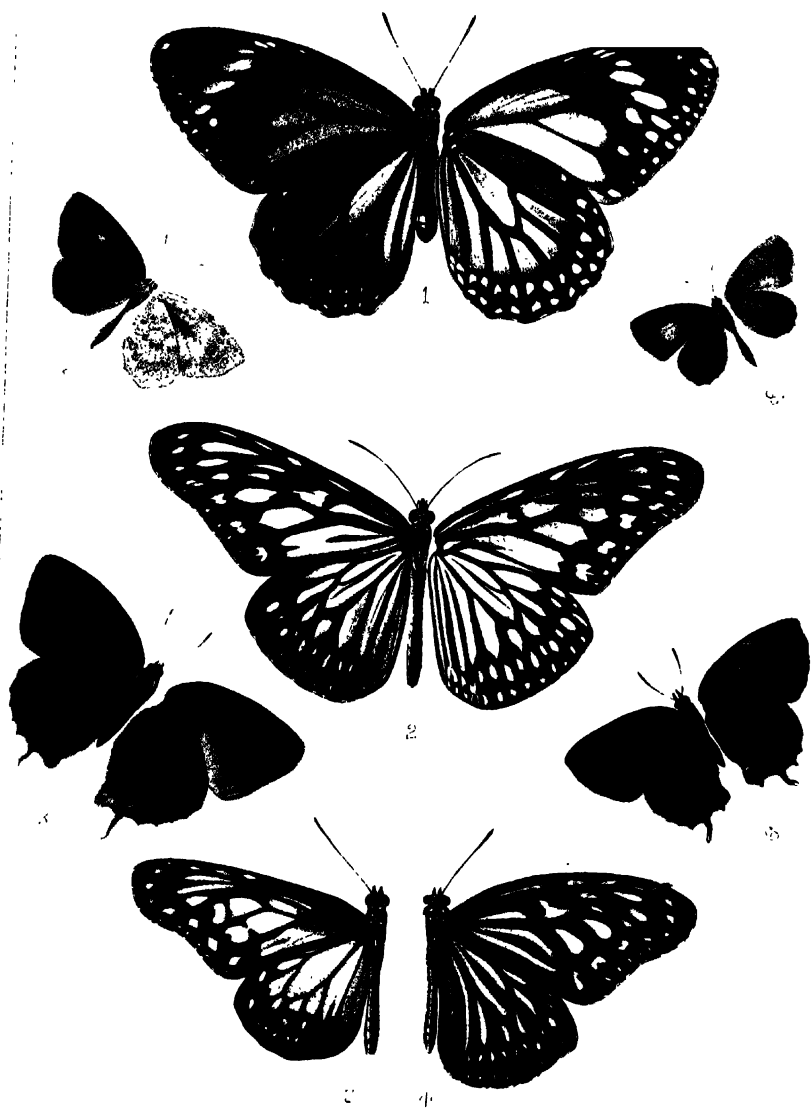
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II.—*A List of the Butterflies of Engano, with some Remarks on the Danaidæ*.—By WILLIAM DOHERTY, Cincinnati, U. S. A. Communicated by the NATURAL HISTORY SECRETARY.

[Received 21st February, 1891, read 4th March, 1891.]

(With Plate I, figs. 1—4.)

The long parallel lines of upheaval which characterize Burma are continued far into the Malayan region in the form of three great chains of islands and mountains. The most eastern of these, and the oldest, being chiefly composed of primitive rocks, consists of the Malay Peninsula, itself built up of several parallel ranges, the Rionw and Lingga groups, Banka and Billiton. The most western includes the Audamans and Nicobars, and the line of islands which may be called the Nias group, lying west of Sumatra, extending perhaps to western Java. Between these two the large island of Sumatra has been formed, probably in times geologically recent. No doubt some parts of Sumatra are composed of older rocks, but till the great volcanic up-





heaval occurred, its place was probably occupied by a few isolated islets, and to this day its fauna is chiefly made up of immigrants from the Malay Peninsula, and in the extreme south-west from Java, the number of endemic species being small. To understand the faunal relations of the Nias Islands, one must eliminate all idea of Sumatra from the mind. Until quite recent times, their relations were, I think, wholly with Java on the one side and the Nicobars on the other.

The Nias Islands lie like a broken breakwater along the western coast of Sumatra, in a line between five and six hundred miles in length, from Pulo Babi to South Pagoh. They are separated from Sumatra by a deep channel nearly a hundred miles in breadth, but in two places more or less bridged by islands. Their united area is now only about 6000 square miles, equal to that of Yorkshire. But they seem to be the remains of a much larger mass of land. The deep sea that surrounds them swallows up all the alluvium from their streams; the tremendous surf on their western shore steadily undermines their hills, and under this process the islands have long been wearing away.

Engano lies much further south, and is wholly surrounded by deep sea, in which it might long ago have disappeared but for the coral reefs that protect most of its coast. It is only eighty miles from Sumatra, to which it has no faunal resemblance whatever. On the other hand, it is 180 miles from South Pagoh in the Nias group, and 210 from Java. But on the side of Java there is only open sea, while on that of Nias there are three or four reefs and islets, and as might be expected from this, Engano may be zoologically considered as an outlying member of the Nias group, with certain Javan affinities.

An excellent description of the people and products of Engano has lately appeared in the *Tijdschrift van Nederlandsch Indië*, but so little is said of the island itself, that I may be permitted a few remarks on the subject. The area seems to be incorrectly stated; it is about a hundred and twenty square miles. The eastern coast is low and flat, bordered in places by mangrove swamps. The western, where the hills attain a height of nearly a thousand feet, descends precipitously into a narrow lagoon filled with branching corals and coral-haunting fishes, and on the reef beyond, the surf of one of the bluest and deepest of seas beats continually with such violence that the whole island seems to shake under it. Engano seems now to be sinking; it has formerly been more or less submerged. A shell of coral rock covers almost the whole of it, thick over the eastern lowlands, thinning gradually to the westward, so that the streams generally break through it there, and flow through deep gorges. In some places the crust has given way so as to form deep little round dells, with stalactite caves piercing their sides,

and a subterranean stream roaring at the bottom, hidden by dense vegetation. The people believe these places to be haunted by evil spirits, and when I wanted to be lowered into one to look for shells in the caves, they all objected most vehemently.

Beneath the coral, the rock seems everywhere a coarse, friable sandstone. If the Nias islands consist generally of this soft rock, it will go far to explain their present fragmentary state.

Until the present generation, the population consisted of a number of hostile tribes, and the older men are still proficient in the use of the spear, and delight in mimic battles and dramatic representations of the surprise of a sleeping enemy. In recent times native vessels have taken to coming to Pulo Dua, two small islands a mile or two off the western coast, for cargoes of cocoa-nuts, and it is probably the growth of this trade that broke down the tribal system. At present Javanese and Malays have now settled in several villages, though Pulo Dua still remains their headquarters, the plague of sandflies making life unendurable to them on the main island. It is to the trading vessels that the Enganese also owe the introduction of diseases that are rapidly killing them off. An outbreak of small-pox carried off all the inhabitants of the two villages near the southern end of the island, and to this day this district is called the Land of Ghosts, and no Enganese will set foot on it. No alcoholic liquors have been brought to Engano; whether this is owing to the precautions of the Dutch, or the religious scruples of the Sumatran traders, I do not know. But syphilis was introduced many years ago, and through it the race has lost all reproductive power. In some of the villages there are hardly any children, and the area of cultivated land decreases every year. The Dutch government, I believe, now contemplates leasing the island to capitalists, and in another century it seems likely that the natives will be entirely replaced by Javanese coolies working under European supervision.

The islanders are of about the same degree of civilization as the Nicobarese. Till lately they are said to have gone about almost naked, and their island is always called Pulo Telanjang or the Naked Island by the Malays. They grow no rice, nor do they make use of the pandanus and cycas as food like the Nicobarese. They make little temporary clearings, surrounded by a stout fence to keep out wild pigs. Their staple food is the taro or *kaladi*,\* which they call *ayudapa*. They also have plantains, papayas and pumpkins, and eat quantities of cocoa-nuts, and drink the water in the nuts, the springs near the coast being usually brackish. They also draw toddy from the tree, though its use is not

\* Our word *Calladium*, though it looks Greek enough, is derived from this, the Malay name of the plant.

habitual as in the Nicobars. They keep fowls and a few pigs, feeding both on cocoa-nuts, and are expert in spearing fish and turtle. Thanks to this abundant diet and the rarity of famines, they have lost the woodman's instincts, and are little better acquainted with the forest and its vegetable and animal products, than are the rice-growing Malays of Borneo and Sumatra, who scarcely know the names of the commonest trees.

Their origin will perhaps puzzle future investigators. Though their physiognomy is odd and characteristic, they seem to be more or less allied to the Nicobarese, but without the negrito strain which seemed to me obvious in some members of that race. The theory has been advanced that the Nicobarese are of Shan or Siamese blood, no doubt on philological grounds, as there is no personal resemblance. On the other hand, the Malays are physically almost indistinguishable from the Siamese, and may roughly be defined as a Shan people, just touched with Polynesian blood in a few localities, and speaking a Polynesian language slightly mongolized.

A list of Enganese words is given in the article I have mentioned. The enunciation is curiously different from the Malay, and is difficult to follow, the vowels appearing to be uttered in several different tones, as in Shan or Chinese. As in Nicobarese, euphony is spoilt by the excessive number of imperfect k's and ng's (the French *n nasal*). These consonants, which rarely occur in Polynesian languages, except the Malay, are generally absent in the personal and place-names, which usually have a strikingly Polynesian air. I spent much of my time at Kayapu, where Pahakela (the *p* is always pronounced halfway between a *p* and an *f*) was chief: the names would be natural in New Zealand or Hawaii.

There seem to be no indigenous mammals on the island except bats, wild pigs and a *Paradoxurus*. This absence of four-footed enemies may have been one cause of the excessive multiplication of birds. One sees more birds in a day in Engano, than in a month in Borneo or Sumatra, and coming from the latter island I was struck with their exceeding tameness. I saw four sorts of parrots and three of pigeons; the latter are never out of sight, the former keep up a deafening noise all day. The species seem generally different from the Sumatran, and no doubt some are undescribed. I think an ornithologist could do good work in Engano.

I think I got nine or ten sorts of land shells of which the greater number must be new. My small collections of moths and beetles were sent to England. The striking features of the latter were the prevalence of *Elateridæ* and the extreme rarity of *Phyllophaga*. No *Cassida* was taken at all.



Frogs, toads, snakes and lizards all abounded, and it is evident that the island has been at one time connected with the mainland, especially as a true cyprinoid fish appears to occur in the streams of the highlands. The coral crust does not imply the entire submergence of the island, while the number of peculiar butterflies shows its long isolation.

The forest is finest on the western coast, where the coral crust is thin or broken. The vegetation is there nearly as grand as on the mountain slopes of Sumatra. This side of the island is evidently very rainy. Even the comparatively barren eastern coast seems well suited to some plants, and in some places the pandani, which do not form thickets by themselves, as in the Nicobars, but grow among other trees, reach a surprising height, one I saw being fully a hundred feet high.

I caught fifty-eight kinds of butterflies, and saw two or three more on the day I landed. Three days of heavy rain followed, after which insects were scarce, and I obtained good sets of only a few species. The heavy forests of the interior scarcely produced anything but *Cyrestis perianther*, *Mycalis mineus*, *Amathusia amythaon*, *Eöecylides tharis*, and *Paragerydus unicolor*. Most of the peculiar *Danaidæ* occurred only close to the shore. Examination of the inland forest at another season may produce true endemic species, such as have been found in Nias. Should any future collector visit the island, I recommend Bua-bua, near the western coast, as the best collecting ground, and April or May as the best season. My own visit was in September, 1890, and lasted three weeks.

The species are mostly local forms of widely spread species. I have felt obliged to give names to thirteen of them, including nearly all of the *Danaidæ*, and these should in most cases rather be called subspecies than species, but as I always give the name of the parent form, this ought to cause no difficulty. My types will be placed in the collection of the Hon. L. W. Rothschild. I have endeavoured to make in the text such comparisons as I could with the species taken by Herr Kheil in Nias, but I find it difficult to sum up the results.

While I have a few criticisms to make on Mr. Moore's well-known monograph of the *Danaidæ*,\* I do not wish to appear ungrateful for the help he has there given to all students of this group. Though some have objected, he seems to have done right in giving names to the numerous subdivisions he has made. At the same time, most of them seem scarcely worthy of a higher rank than that of subgenera, and some are founded on minute and unreliable characters.† His classification

\* In the Proceedings of the Zoological Society for 1883.

† Such as the rudimentary recurrent vein in the cell of the forewing, a feature

is dubious, and some of his species worse than dubious. But in any case he has let a flood of light into one of the darkest corners of entomology, and all future work in this family must start from his as a base.

I do not see any reason for accepting his term *Euplaina*, instead of the commonly received *Danaidæ* or *Danaine*. The name *Danaus* necessarily falls, having been used for *Pieridæ*. But *Danaida* and *Danaïs* are both older than *Limnas*, and there can be no similar objection to them. Mr. Scudder, with his usual conscientiousness, has adopted *Danaida*, the earlier of the two names. But I think his verdict may be reasonably traversed on the ground of the irregular formation of *Danaida* and the universal use of *Danaïs*. It can hardly be seriously maintained that the latter name cannot be used on account of its resemblance to *Danaus*. So the group obviously remains the *Danaidæ* (or *Danaine*), the genus *Danaïs*, and its type *plexippus*,\* *Anosia* falling before it.

Mr. Moore's primary division of the family is into two groups, the *Limnaina*, including *Danaïs* and *Hestia*, and the *Euplaina* including

which seems to vary in different specimens. *Mahintha* was founded on a local race of *Euplœa core*. *E. simulatrix* was placed first in *Vadebra* (*Crastia*) and then in *Menama*, though it obviously cannot come into either, or into the "section" in which both are placed.

\* The name now applied to a butterfly known to every American farmer as *archippus*. These useless changes of name now so much insisted on, especially by American naturalists, are bringing scientific nomenclature into well-deserved disrepute among all outsiders. Surely there ought to be a statute of limitations; security that some one, turning over musty volumes of pre-scientific times, shall not make all existing works obsolete. At present we stop short at Linnaeus. This is purely an arbitrary line. The next generation will perhaps go back to Ray and Swammerdam; with the aid of a little zeal and imagination quite a number of generic names can be found in their books. The first false step taken was the acceptance of Hübner's childish work as an authority. There was *Adolias*, a genus described by such a profound and discriminating writer as Boisduval, and accepted by all naturalists. Finally, some one discovered that a few years before the date of Boisduval's great work, Hübner, a contemporary, not of Linnaeus, but of Latreille, had invented a genus *Euthalia*, described merely as "dark with white and red spots," containing *lubentina* and *adonia*, and placed in an imaginary family, prettily named *die Fröhliche* or The Joyful Ones. *E. aconthea*, and *E. evelina* (the latter along with an African *Aterica* and a European *Apatura*) were at the same time placed in different genera of another imaginary family called *die Muntere*, or The Lively Ones. And so, to the confusion of naturalists all over the world, *Euthalia* took the place of *Adolias*. Lepidopterists have yielded to an infinity of similar changes. It remains to be seen whether coleopterists will be equally submissive. Mr. Crotch now proposes to alter the names of a number of the best-known genera of beetles, names consecrated by a century of use. I cannot help wishing his opponents all success in the struggle against *ce malencontreux droit de priorité*, as M. Deyrolle calls it.

*Euploea* and *Hamadryas*. The only difference mentioned, is that in the former there is usually a precostal cell in the hindwing, wanting in the latter. Now, it is true, an obscure rudiment of one is present in some species, but better distinctions can easily be found. *Hamadryas* probably does not belong to this family, but to the *Neotropidæ*.\* *Hestia* has undoubted affinities with *Danais* in its neuration and markings, but in its anal tufts, its egg, and the structure of its feet, it is more like *Euploea*, while its antennæ show how remote it is from either. So I would suggest the following classification instead of Mr. Moore's.

*Tarsi with large paronychia and pulvillus.* Anal tufts two or four.

Antennæ filiform, *HESTIA Group.*

" clavate, *EUPLOEA Group.*

*Tarsi with rudimentary paronychia and pulvillus†.* Anal tufts two.

*DANAIS Group.*

Mr. Butler, to whom we owe the classification of the *Euploëas* by the male marks, accepted, as all previous writers had done, Cramer's *core* as the type of the genus, and formed the genus *Macroplœa*, with *elisa* as its type, applying Hübner's name *Crastia* to *climena* and its allies. This arrangement has been generally adopted, and it is most unfortunate that Mr. Moore should alter all three names on what may be called archæological grounds. *Core* has been accepted for a century as the

\* I do not know whether Schatz's name can stand, as it is not derived from that of any genus, and has no type. The name *Erycinidæ* has been dropped by some writers for this reason, the generic name *Erycina* having been superseded.

† The appendages of the last joint of the tarsi of butterflies are, 1st, the claws, 2nd, the paronychia, 3rd, the pulvillus with its shield. The *paronychia* are tactile organs, one on each side of the foot, slender and flexible (not jointed as some writers have said), covered with short sensitive hairs or *papillæ*. In most cases they are split into two long finger-like process, the longer following the course of the claws, the shorter curling round the edge of the pulvillus-sheath, obviously with the object of examining the surfaces touched by these two organs. The *pulvillus* is a soft, muscular projection, resembling an additional tarsal joint, but not armour-clad like the others. It is evidently intended to act as a buffer, to break the shock of alighting, and no doubt owes its name *pulvillus*, or cushion, to this function. Its lateral surface is sensitive, with papillæ like those on the paronychia. But its lower surface is covered with a round corneous plate, or shield, which no doubt acts as a *sucker*, flexible in life, slightly concave in the middle. This is easily detached in dried specimens.

Now in certain butterflies of aerial habits like *Danais*, the claws have been greatly lengthened, so that the pulvillus did not touch the surface on alighting. Thus losing all function, it has shrunk into a small, hard, inflexible mass. The paronychia have similarly lost their use, and remain in various stages of obsolescence. They are still distinct in *Ideopsis*, and retain their bifid shape, though too small to be of use.

type of *Euploea*, and although it would be more pedantically accurate to follow Fabricius rather than Cramer, it seems a pity to confine the use of *Euploea* to two or three species (with their local forms) forming a small aberrant genus, now well-known as *Macroploea*, while hundreds of species cluster around *core* as their natural type and centre. *Macroploea* (Mr. Moore's *Euploea*) is a true genus, and must be ultimately recognized as such. But unless we accept M. Moore's little groups as genera, we must find some general name for the large mass of species remaining. It is unlikely that naturalists will consent to call them all *Crastia*. Surely they had better keep the name of *Euploea* as before, with *Crastia* (= *Vadebra*,\* Moore) as a subgenus under it.

As to the position of the family as a whole, I understand that Mr. Scudder now gives it a low one, below the *Apaturidæ*, *Nymphalidæ* and *Satyridæ*. Much, however, may be said in favour of retaining it at the head of butterflies. The shoulder plates are in most butterflies shaped more or less like a human foot as seen from the side, having a long posterior process. It is only in the *Danaidæ* and the *Acræidæ* that they are simply semicircular in shape (in the *Danaidæ* more than half a circle) without the posterior process. The process is also greatly reduced in *Cynthia* and *Cethosia*, the nearest genera of the *Apaturidæ*, while in the lower forms of the *Tetrapodæ*, the plate greatly resembles that of other butterflies. The long claws of the *Danaidæ*, culminating in *Danais* with its aborted paronychial, may also show a higher development than other *Tetrapoda*. But they are also found in the *Papilios*, and seem to go along with a prolonged and aerial flight. The fore-feet of the male still retain the tarsus, which is lost in most *Neotropidæ* (*Ithomiadæ*), but it is less developed than in the *Morphidæ* and most other higher butterflies.

The striking feature of the *Danaidæ*, however, is the more perfect development of the fore-feet of the female into sensory organs much resembling the antennæ, but set with highly specialized tactile hairs or papillæ.† I have taken a good many notes on this subject, on which so far as I know nothing has yet been written, and when they are more complete, I hope to publish them. So far as examination has yet shown me, there seems to be a gradual development upwards from the *Morphidæ*, in which the joints are tapering, the last the slenderest, with a conspicuous pulvillus and rudimentary claws with their appertaining hairs. In the higher groups, these tarsi become less and less like a foot, and

\* Mr. Moore applied this name to two different genera of butterflies in the same issue of the Proceedings of the Zoological Society.

† These also occur in all *Tetrapoda*, and in some other groups, as the *Nemobiadæ*, but are there few and small.

more and more like a palpus. The *Satyridae* and *Nymphalidae* are more developed in this respect than the *Morphidae*, and the *Apaturidae* much more. The *Neotropidae* according to Mr. Godman have the foretarsi of the female not clavate, and hence probably less developed. In the *Danaidae* and the nearest *Apaturidae* (*Cethosia* and *Cynthia*), they attain their largest development. This can hardly be an organ of touch, because these feet are poorly provided with muscles, and are capable of but little movement. It may be an organ of hearing, but it is more likely one of smell, correlated with the scent-producing glands of the male. It is significant that in the *Neotropidae*, where this foot is more normal, the male has no anal tufts.

I think the special development of this organ, which is found in all Tetrapod butterflies, though but little specialized in the lowest, is an argument for the high rank of the *Danaidae*. But I am aware that the feet of butterflies often vary most irregularly, independently of the general organism. The aborted forefoot of the male shows some such inconsistencies, rudiments being, as Darwin has shown, eminently variable. *Melanitis* and *Bletogona* in the *Satyridae*, many *Pieridae*, and at least one genus of the *Lycenidae* have the claws bifid. The number of joints in the forefeet of female Tetrapods also varies. And in *Pseudergolis*, a genus of the *Apaturidae*, differing but little from its neighbours in other points, the fore-tarsi of the female, though small, are quite perfect, with claws, pulvillus and bifid paronychialia. This fact would place it quite outside of the Tetrapod butterflies, near the *Nemeobiadae*, if the feet offered really reliable characters.

The prehensors of the *Danaidae* are chiefly remarkable for the aborted uncus and the broad flat clasps. They do not vary much in the different species; most in *Hestia* and some kinds of *Danais*. My notes are insufficient to permit me to generalize on the subject. It is remarkable that the only species in which they are really very aberrant is *Danais aglaioides*, where the clasps are prolonged downwards, and exposed to view even in dried specimens. This butterfly is closely allied to *D. aglaia*, differing chiefly in the shape of the wings, and they are found together over much of their range. It seems likely that in this case the prehensors have been strongly differentiated to prevent hybridism, and keep the species separate.\*

\* This may also be the case with the genus *Lampides*, where a number of protected species, remarkably alike in colour and markings, have the prehensors extremely unlike, and so differently armed with hooks and pincers, that the union of different species would presumably bring about serious consequences. Great confusion has been caused here by the Gorman lepidopterists, who have recently figured a great many species with very brief descriptions, and no account of the prehensors. The

The egg also varies little in the *Danaidæ*, and affords few characters for classification. It is slightly like that of *Libythea* (which more resembles that of the *Pieridæ*), and is nearly identical with that of the *Acraeidæ*, and with those of *Cynthia* and *Oethosia*, the first genera of the *Apaturidæ*, which are again connected by several links with *Argynnis*, where the series seems to end. In the *Danaidæ* it is large, soft, cartridge-shaped, more than half again as high as wide, yellowish, or sometimes pearl-white. It has a variable number of upright ribs anastomosing near the apex (where the reticulations are more or less hexagonal over a varying extent of surface), and with horizontal cross-lines varying greatly in number and in distinctness, and generally hard to count. I append a list of species with the number of vertical ribs on the egg of each, and with that of the cross-lines in parenthesis, whenever I know it. The numbers always vary slightly in the same species, and that of the cross-lines can only be given approximately. The egg of *Nectaria* and *Macrophea* I forgot to examine. That of *Hestia* is unlike the others in having the reticulations more or less hexagonal, the ribs being slightly zigzag. The figures support the idea that *Hestia* is nearer *Euphea* than *Danais*. It will be observed that in *Danais* (including *Ideopsis* and *Radena*, which are practically identical) the cross-lines are usually more numerous than the ribs, while in *Hestia* and *Euphea* they are fewer, *Stictophea* coming near *Hestia* in this respect, as well as in the anal tufts. The figures for *Danais chrysippus* and perhaps *limniace* and *tylia* are doubtful.

HESTIA Group.	<i>Hestia cadellii</i> ,	21 (14).
	<i>hadenii</i> ,	23 (14-15).
	<i>lynceus</i> ,	21 (14).
EUPHEA Group.	<i>Stictophea lacordairei</i> ,	27 (13).
	<i>Salpinx novaræ</i> ,	26.
	<i>kollarii</i> ,	22-23 (20).
	<i>splendens</i> ,	22 (18-19).
	<i>Euphea esperii</i> ,	26.
	<i>camorta</i> ,	31.
	<i>simulatrix</i> ,	30.
	<i>core</i> ,	34 (23-25).
	<i>midamus</i> ,	24-25 (20).
	<i>alcathoë</i> ,	39 (26-27).
	<i>rhadamanthus</i> ,	21-23 (15).
DANAIS Group.	<i>pinwillii</i> ,	26 (18).
	<i>Danais genutia</i> ,	32 (30).

revision of this genus, which is further complicated by the prevalence of local and seasonal forms, will prove a heavy task to future naturalists.

<i>Danais hegesippus</i> ,	31-34 (29-30).
<i>nesippus</i> ,	34.
<i>chrysippus</i> ,	34 ("nearly 50" ?).
<i>gautamoides</i> ,	23-24.
<i>limsiace</i> ,	25 (25).
<i>septentrionis</i> ,	19-21 (30).
<i>melaneus</i> ,	16-18 (27).
<i>larissa</i> ,	20-21 (30).
<i>tytia</i> ,	20-21 (38).
<i>melanoleuca</i> ,	19 (22).
<i>aglaia</i> ,	17 (26-27).
<i>aglaioides</i> ,	15-16 (25).
<i>Ideopsis daos</i> ,	15 (25).
<i>Radena nicobarica</i> ,	16.
<i>vulgaris</i> ,	14-16 (25).

Next comes the vexed question of scent-glands. I was so discouraged by the loss of all my notes on this and other structural matters in 1887, that I have taken but few since, so I cannot now speak with much authority on the subject.

It seems probable that there is a disagreeable odour in all *Danaidæ*, apart from that of the anal tufts and alar glands. Though infinitely less in strength than it is in the *Agaristidæ* and other moths, it is still quite perceptible on pinching some species, such as *Danais genutia*, *crocea* and *vulgaris* (which smells of sorrel). In others I cannot make it out at all. This smell is probably associated with a taste highly disagreeable to spiders, chickens, etc. The results of my experiments made some years ago in the Celebes, Java, etc., are now lost, but in the Malay Peninsula I lately made a few on spiders, with the following results. Except in the case of the first two species, they cannot be entirely trusted.

Species always rejected, *Danais genutia*,  
*Radena vulgaris*,  
*Ornithoptera ruficollis*,  
 (only two offered).

Species sometimes rejected, *Euplœa midamus* ;  
 „ *rhadamanthus*,  
*Neptis varmona*,  
*Cethosia hypsina*,  
*Loxura atymnus*,  
*Lampides ælianus*.

Species never rejected, *Neptis* sp.  
*Athyma* sp. etc.

It is to be observed that the *Radenas* are perhaps the most perfectly

protected of the *Danaidæ*, and yet they are not brightly coloured, they have no alar scent-glands, and the anal tufts are the smallest in the whole family, and give the least fragrance.

Apart from those producing the odour pervading the whole body, four different classes of scent-glands have been pointed out.

The first are the impressed silky streaks of altered scales on the forewings of some *Euplæas*, often called *brands*. Mr. Distant oddly enough calls these pseudo-scent-glands, taking the falsity of their claims for granted, while assuming to leave the question open. The marks in question seem to consist of scales only, and I have not yet observed any glands connected with them. Though not very conspicuous in some cases, they may be addressed to the eye of the female, and help her to recognize the male of her species. For odours vary but little in the *Euplæas*, and the amount of mimicry is so great that in most localities there are several species similarly coloured but bearing different sex marks. In any case these brands can hardly be protective, and the assumption by some writers that a species furnished with them is better protected, and more likely to be a mimicked than a mimicking form, is without foundation.

The variously-coloured velvety patches on the hindwing of *Trepsichrois*, *Salpinx* etc., are no doubt true scent-organs. In the case of *Trepsichrois midamus* the odour is sometimes quite perceptible in the detached hindwing, while in *Salpinx* and *Calliptera* it is apparently excited by friction against the forewing. In some cases, such as *Euplæa oceanis*, described below, the velvety area is on the underside of the forewing.

The "pouches" on the hind-wings of certain species of *Danais*, such as *D. limniace*, are probably true scent-organs, though neither Professor Wood-Mason, who has given them special attention, nor myself, have been able to detect any odour. He has kindly shown me a microscopic section of the pouch. The cavity is lined with a semi-circle of long cylindrical cells radiating from it, their nuclei near their inner ends, the outer wall of the mass thick and chitinous, the inner membranous, with the attached scales aborted. According to Professor Wood-Mason, the odour-giving fluid is presumably manufactured in these cells, and not merely drawn from the body and stored in them. An account of these pouches, apparently made from the study of dried specimens, has appeared in the work on the "Duftapparate indo-australischer Schmetterlinge," by Dr. Erich Haase of Dresden.

Finally there are the abdominal tufts which we find in this family alone of all butterflies. They resemble those of the *Callidulidæ*, but are more specialized, though proportionately smaller than in these and



many other moths.\* They exist in a very rudimentary state in the female, and can as in the male be forced to the surface by the action of the fluids in the body. From some such small beginning, they have grown to their greatest development, several stages of the process remaining as fixed characters in the different genera. The smallest tufts occur in *Radena vulgaris*; they are much longer in *R. juvena*. The greatest development of simple tufts occurs perhaps in *Euplwa* (*Trepsichrois*) *midamus*. In all the species of the *Danaï*s group the tufts are simple and single, only in *Tirumala* the hairs are curled at the tips. They are also simple in the majority of the old genus *Euplœa*, and I limit the name to these. The gland in all these consists, when protruded, of a finger-like projection extending laterally on each side of the abdomen, and bent round forwards (i. e., towards the head) in a semicircle, bearing long odoriferous hairs to the very tip.

But in the genus *Salpinx*, as limited by Mr. Butler (including Mr. Moore's *Salpinx*, *Isamia*, *Pademna*, *Satanga* and *Selinda*, but not apparently *Danisepe*), and also in his genus *Calliplœa*,† while the gland is similar (somewhat longer and more bent), the long hairs are gathered chiefly around its base, the outer part being naked, except at the extreme tip, where there is a brush of short, stiff bristles, sometimes coloured differently from the long basal hairs. This terminal brush is only seen when the gland is fully protruded. The development of this form from the first is obvious. This group is also large, but the number of species seems to me to have been greatly exaggerated.

In more advanced forms, a new gland, generally somewhat shorter than the other, has been pushed out from its hairy base on the anterior side. In this case both glands are covered with hair to the tip, the space between their bases being naked. This occurs in the genus *Hestia*, and apparently also in *Macropilœa* and *Stictoplœa*‡ as defined by Mr. Butler.

Finally in the single genus *Neclaria*, while the posterior tuft remains unchanged, the anterior or last developed one is again absorbed, and is represented by a microscopic tuft at the base of the other. This can hardly be the incipient stage, as it is too small to be of any use, and the nature of its origin is obviously as given above. It hence appears

\* In most moths these tufts are attached to the prehensors or claspings-organs of the male.

† Herr Georg Semper and Dr. Haase consider *Calliplœa* identical with *Euplœa* (i. e., *Macropilœa*), but I cannot agree with them. *Calliplœa* scarcely differs from *Salpinx*.

‡ My drawings of the glands of *Macropilœa* and *Stictoplœa* were lost in 1887, and I have not examined those organs since. But my impression is that they are very similar to those of *Hestia*, though somewhat less developed.

that *Nectaria* has attained the furthest development in this regard, and may still with good reason be retained at the head of the *Danaidæ*, and of all butterflies.

The following scheme will serve to show the relations of the genera of this family. Mr. Moore's genera may be reduced to subgenera, though *Parantica* and perhaps one or two others may be retained.

- A. Feet with well-developed paronychial and pulvillus.
  - B. Forewing with a pre-discoidal cell.
    - C. Anal glands four, two aborted, ..... NECTARIA.
    - C. Anal glands four, none aborted, ..... HESTIA.
  - B. Forewing with no pre-discoidal cell.
    - C. Glands four (?), none aborted.
      - D. Forewing of male with no brand, ... MACROPLÆA.
      - D. Forewing of male with two brands, ... STICTOPLÆA.
    - C. Glands two, tufts four, ..... SALPINX.\*
    - C. Glands two, tufts two, ..... EUPLÆA.
- A. Feet with rudimentary paronychial and pulvillus.
  - B. Hindwing triangular, with scent-pouches, ..... DANAI.
  - B. Hindwing triangular, without scent-pouches, ... RADENA.
  - B. Hindwing rounded, generally without scent-pouches, ... IDEOPSIS.

There seem to be grounds for believing that the scent-tufts in the male serve three distinct purposes, 1st, to warn off enemies, 2nd, to attract the female by colour, 3rd, to attract her by odour.†

1st. The odours given forth are in some cases unpleasant. In *Danais limniæ*, it is that of turmeric, and is downright disagreeable. Other species of *Danais* have the peculiar aromatic fragrance characteristic of so many protected Mediterranean plants. In the genus *Salpinx*, in which the tufts reach their greatest development in size, the odour, though exceedingly sweet, is almost overpowering. Now it may at first sight seem absurd to say that the scent of honey may protect an insect from its enemies. But we know this to be sometimes the case. The male of the singular Hesperian, *Calliuna pieridoides* has assumed conspicuous white colours along with a delicious odour, the female remaining dark and odourless.‡ The fine Malayan Morphid,

\* Including *Callioplæa*.

† The odour is not always present, but comes and goes, whether by the exhaustion of the supply, or by the will of the insect, it would be interesting to learn. I have sometimes examined the tufts of several males one after the other, without detecting the perfume.

‡ Mr. de Nicéville recently discovered the female, and it turned out to be dark, as I had predicted.

*Melanocyna faunula*, is saturated with sweet perfumes, and drifts feebly about the country, fearless of enemies. The fragrant butterflies of the genera *Stichophthalma* and *Tenaris*, though no doubt not so completely protected, are so conspicuously coloured and fly so feebly, that one cannot suppose them to be eaten by birds. The *Ornithopteras*, though I have shown by experiment that they are protected from some enemies, smell of nothing worse than petunias. I have heard that cattle will not touch peppermint or pennyroyal, though the scent of those plants is so pleasant to us. On the whole I do not doubt that slow-flying, brilliantly-coloured insects like *Trepsichrois* and *Salpinx* are more or less protected by their scent-tufts.

2nd. Colour in the tufts seems a later development than odour. In *Radena*, where they are least developed, the tufts are of very inconspicuous hues. In *Danaïs* they are usually not at all brilliant, though it must be admitted that the odours are also less developed in these. But in some species the hairs are curled,\* and this may be an ornamental development. In the *Euplaeas* the growth of colour and odour go on *pari passu*. The brilliant ochreous tufts of *Trepsichrois* contrast finely with the black and shining blue of the wings, and are visible from a long distance. This colour appears in a great many species. In *Salpinx* the tufts are still larger, and the small terminal pair are frequently coloured differently from the others. In *Hestia* the anterior tuft seems usually coloured otherwise than the posterior, though in *H. cadellii* they are both dull grey.

3rd. The great majority of the family smell of honey or of flowers—vanilla, tuberoses, jasmine, etc, and outside of the *Danaïs* group, the only aberrant perfume I can remember is that of winter-green,† which is also found in butterflies of other families, and in Pyralid and Geometrid moths. But honey- and flower-like smells are the rule. This suggests the possibility that the odour-producing particles may not be manufactured by the insects, but be derived directly from the plants they frequent. At any rate the attractive scent must often be identical with that of the flowers on which they feed. So that it does not seem incredible that the female should sometimes be wooed under false pretences, and led to expect a dinner instead of a lover.

Male *Euplaeas* often meet in great swarms, haunting some particular spot in the forest for many successive days, some perching on leaves and flowers, but most circling slowly around, many of them displaying their tufts, so that the air is noticeably permeated with their fragrance. Many different species meet on these occasions, as if recognizing the

\* This is also the case with a few *Euplaeas*, such as *alcathoë*.

† The same smell is given out by several tropical plants.

family relationship of all. The females may at the same time be lurking hard by in the jungle, though in smaller numbers, a few of them sometimes joining in the flight of the males. I have often observed males flying alone with expanded tufts, and I suppose they are trying to attract the female from a distance, appealing rather to her sense of smell than that of sight. In the presence of the female, the male keeps his tufts in continual action, and whether of dark or bright colours, they may well be as attractive to her eyes, as the plumes of the cock grouse or peacock are to his hens. The eyes of butterflies are so prominent, that though the female never faces the male, but keeps gliding on just before him in coy retreat, I cannot think that any grace of his escapes her notice. But her sight is probably not so strong as to recognize these ornaments at a great distance. So that the attractive colours are presumably intended to take effect at close quarters only, while with a favourable wind the odour is no doubt perceptible far away. I myself cannot generally make it out more than two or three feet away. But the forefeet of female *Danaïdæ* seem to be developed into a powerful organ of smell, and even apart from this, that sense must be keen in all butterflies, since they are attracted from long distances by the scent of flowers. And few flowers are so fragrant as these insects.

### *List of Enganese Butterflies.*

#### Family DANAIÐÆ.

1. *NECTARIA LEUCONOE*, Erichson, var. *ENGANIA*. This slight variety seems darker than the typical *N. leuconoe*, as figured by Doubleday, just as *N. clara* (as figured by Herr Semper) is much lighter. The base is but slightly touched with creamy, and more so in the female than in the male. The dark lines in the cell of the forewing are distinct, the black transverse area there narrower and more quadrate than in *leuconoe*, the discal dark markings are more connected, and those on the hindwing are more triangular, the wedge-shaped white spot near the lower angle of the forewing is distinct, and in general the markings are very clearly cut and distinctly outlined. The male has two large whitish abdominal tufts, each with a minute rediment of another near its outward base.

2. *MACROPLMA CORUS*, Fabricius, var. *MICRONESIA*. Somewhat resembling *M. corus (elisa)*, with the size and shape of *M. phæbus*. Male, forewing with the spots minute, one in the cell, seven in a bent discal series, and ten submarginal dots. Hindwing with two or three discal, and one or two subapical dots. Below, forewing with a dot in the cell, two large discal spots with a dot below them, two subapical dots, and

a submarginal row of thirteen dots. Hindwing with three discal dots subapically, and four or five submarginal ones. The single female has the spots still fewer and less conspicuous, the submarginal ones wanting except at the apex.

As I took only two or three specimens, I can hardly describe this form as a distinct species. It seems greatly to resemble *M. semicirculus* from the Moluccas. The extreme smallness of the spots easily distinguishes it from *M. pharetena*, described by Herr Kheil from Nias. *M. pharetena* (the name was perhaps intended as an anagram of *phænarete*) seems to be simply the female of *M. phæbus*, which he also includes in his list of Nias butterflies.

3. *SALPINX PHANE*, n. sp. Male, above rich velvety blue, resplendent in some lights, the hindwing nearly equally brilliant, whereas in *S. novaræ* and *S. vestigiata* it is all brown. Forewing, with one costal and the usual interno-median pale blue spot, and a row of seven outer-discal ones, of which the first three are united, the third the largest. Hindwing generally with two subapical spots. *Below*, rich violet brown; the spots are sometimes wholly wanting in both sexes, but generally one or two remain subapically on the hindwing. The male before me has five subapical spots in two series on the forewing and four larger ones on the hindwing. The larger tufts are dark brown, the small terminal ones whitish. The female is less richly coloured, the hindwing being brown: there are two elongate blue spots in the interno-median space of the forewing above.

This is a local form of *S. leucostictos*, Gmelin, but it seems more distinct from the Javanese type than are either the Malaccan (*vestigiata*) or the Nicobarese (*novaræ*) forms.

4. *EUPLEA (TREPSICHOIS) MALAKONI*, n. sp. Male like *E. multiciber* but with the hindwing blue like the forewing, though less brilliant, whereas in the other species it is brown. The odoriferous patch on the hindwing occupies all the end of the cell, extending to the upper median vein. The pale blue spots of the forewing, though variable, are few and inconspicuous; in the specimen before me there are only nine in all, some very minute. The female varies greatly in the distinctness of the spots, but in all cases the forewing has no trace of blue, which distinguishes it from the other local forms of *E. midamus*. Tufts bright yellow.

5. *EUPLEA (CRASTIA\*) ENGANENSIS*, n. sp. It greatly resembles

\* Mr. Moore's *Vadebra*.

*E. climena* from the Moluccas, and is near *E. sepulchralis*, Butler, from Java, but with the forewing imperceptibly paler outwardly, while the hindwing is very distinctly so, both above and below. Both sexes are rich brown above, without any trace of blue; the female has a single whitish spot in the middle of the disc. Below, there are usually on the forewing, one large violet-white spot in the cell, two or three subapical dots, two submarginally in the median spaces; five discal ones, the lower two larger and quadrate, the middle one slender, the upper two usually minute. Hindwing with one spot in the cell, a semicircle of six beyond it, then a curved series of about eight, (those below the middle median vein minute or wanting), and four submarginal spots near the apex, occasionally five or six. Tufts bright ochre.

This common species outwardly resembles *Euploea simulatrix*, Wood-Mason, from the Nicobars, which, however, has a large sex-mark, somewhat as in *Salpinx*, on the hindwing above. Mr. Moore placed this species first in *Valebra* (*Crastia*) and then in *Menama*, where it certainly does not belong.

6. *EUPLOEA* (*CRASTIA* ?) *OCEANIS*, n. sp. Male. Above dark brown with dull bluish reflections in some lights, the margin not visibly paler. Below uniform dark violet-brown, the markings varying greatly, most of them elongate but small. Forewing with one spot in the cell and seven beyond it, the upper ones slender, sometimes minute; a line of five outer-discal spots, the upper ones frequently absent; the female has sometimes a sixth spot in the interno-median space, beyond the line of the others. Hindwing with a small spot in the cell, and a row of 6-7 larger ones beyond it, and then a very variable series of 5-10, all but the first (which is sometimes absent) forming nearly a straight line: beyond these there are generally a few submarginal dots, sometimes forming an irregular line of ten.

The female has an obscure whitish spot in the cell of the forewing above, and seven similar ones beyond it, the upper ones slender. Beyond this the outer discal spots are slightly indicated. Hindwing with the outer discal line of spots indicated in various degrees.

The form of the wing in this species is as in Mr. Moore's genus *Gamatoba*, but the sex-mark is peculiar. The female has an elongate white mark on the underside of the forewing, below the lower median vein. Both sexes have the hind margin broadly whitish and shining below the internal vein. In the male there is a slightly velvety grey-brown patch of altered scales forming an elongate, quadrate mass, from the internal vein nearly to the lower median, equally divided by the wrinkle representing the submedian vein.

This species can scarcely be included in any of Mr. Moore's sub-genera, and I know no described form resembling it. It was unluckily out of season when I was in Engano, and I only got two or three in fair condition, the rest being worn and faded.

7. *EUPLOEA PAHAKELA*, n. sp. Male, above, forewing rich brown, not at all lighter outwardly; hindwing paler brown, slightly darkening near the margin; a single "brand" like that of *E. core*; no other markings above in either sex. *Below* there is a rounded violet white spot in the cell, and a larger pinkish one in the lower median space, one in the upper median space, and sometimes one in the space above. Hindwing with a small spot in the cell, and 3-5 minute ones beyond it. There are sometimes traces of obscure subapical and subanal dots. Tufts bright ochre. The female is very pale brown and remarkably translucent; it has a long white streak below the lower median vein on the forewing below.

This species seems to have no near allies except *E. camorta*, Moore, from the Nicobars, which obviously differs in the pale borders of the wings.

Besides the *Euploas* mentioned, I believe I saw a species of *Calliploa*, near *mazares*, flying at Kayapu on the day of my arrival.

The *Euploas* of Nias, as described by Herr Kheil, differ greatly from those of Engano; there can hardly be more than one species (a *Salpinx*) common to both. I append the list.

## Nias.

*Macroploea phabus*.

„ *phaeretena* (♀ of preceding?)

*Euploea* (*Tronga*) *niasica*

„ (*Trepsichrois*) *verhuelli*.

„ (*Penoa*) *menetriesii*.

## Engano.

*Macroploea micronesia*.

*Euploea* (*Trepsichrois*) *malakoni*.

*Euploea* (*Crastia*) *enganensis*.

„ „ *oceanis*.

„ *pahakela*.

*Salpinx phane*.

*Salpinx leucostictos* (perhaps the same as *phane*).

„ (*Isamia*) *lowii*.

„ „ *staudingerii*.

„ (*Tiruna*) *ochsenheimeri*.

? *Salpinx* (*Calliploea*) *sp.*

The absence of the true *Euploea* (*Core* group) and of *Crastia* (*Olimena* group) from Nias, and of *Tronga* and *Isamia* from Engano, are interesting.

8. *DANAIS PIETERSII*, n. sp. Pl. I, Fig. 1. Male and female, above black, forewing with the lower part of the cell, the basal part of the lower median, and the greater part of the interno-median space dull ferruginous, the veins black. Margin touched with white at intervals; a line of four submarginal white dots in the median spaces; another larger and diffused near the lower angle; an inner line of seven white marks, of which the pair in the upper median space is of some size, the other dots: a subapical band of six widely-separated diffused whitish spots from the costa, the lower two largest; below these two obscure spots in the upper median space. *Hindwing* black, a large, pale ferruginous area in the cell, and others in the submedian and internal spaces extending three-fourths towards the margin; shorter, slender ferruginous streaks in the other discal spaces: two lines of submarginal whitish dots mostly obsolete, more distinct in the median spaces; cilia alternately black and white. *Below*, similarly marked but with the spots more distinct and numerous and violet-white instead of whitish; the lower part of the forewing ferruginous, the apex, as well as the outer part of the hindwing, suffused, with dull, dark reddish, which takes the place of the black. *Hindwing*, with pale ferruginous areas in all the spaces, most of them bordered with silvery white, the veins dark; the two submarginal series of the white spots distinct and complete. In some specimens the cell is nearly white, the inner ferruginous area evanescent.

I am not able to compare this species with *D. eurydice* from Nias, but judging from the forms with which Mr. Butler compares it, that species is without the ferruginous areas on the hindwing above.

I name this for my kind friend Mijubeer Pieters, Controleur of Kroë in Sumatra. It is a common and conspicuous species in Engano, whereas Herr Kheil describes *D. eurydice* as rare in Nias.

9. *DANAIS (BAHORA) CHRYSEA*, n. sp. Pl. I, Fig. 3. A local form of *D. philomela* from Java, differing in the subapical spots being more elongate, and in all the markings of the forewing being yellow except the two outer series, the yellow area of the cell heavily clouded with black scales except at its lower angle, in this resembling *D. crocea*. The interno-median yellow area shows is divided by a line of black scales in the middle, the quadrate discal spots are partly joined, as in *crocea*. *Hindwing* marked as in *crocea* and coloured as in *philomela*. The wings are very long and narrow. The female has the yellow area more restricted, all the spots larger and more conspicuous.

I think I saw *Parantica aglaia*, or its representative, on the day of my arrival at Engano, but no specimens were taken.



10. *RADENA LONGA*, n. sp. Pl. I, Fig. 2. A local form of the Javanese *R. juvena*. Forewing very long, falcate, the white markings mostly elongate and reduced, cell of forewing with the basal mark slender, clavate at tip, the outer one small with the upper streak absent, the discal spots beyond the cell much reduced. Hindwing, with the white area in the cell broken by two dark lines, the upper wide, the lower slender, not quite continuous; all the discal spots beyond the cell slender and elongate.

11. *RADENA MACRA*, n. sp. Pl. I, Fig. 4. A local form of *R. vulgaris*, the forewing elongate (but shorter than in *R. longa*), falcate, cell with the basal mark bifid, the upper streak slender, not so long as the lower, the outer spot narrow at its upper end, with a minute spot adjoining it above, and without the slender prolongation present in *R. vulgaris*; the three spots beyond the cell greatly, and all the others more or less reduced in size. Hindwing with all the spots reduced, that in the cell simply bifid, without any spot in the bifurcation (such as occurs in *R. vulgaris*). The submarginal dots are wanting on the apex of the forewing above and below.

These two *Radenas* are about equally common, and are found together. In the island of Sumbawa, east of Java, two *Radenas* also occur, but in this case the *juvena* form is restricted to higher altitudes, though there is a zone in which both are found. These facts surprised me as I had supposed *juvena*, like *vulgaris*, to be simply a local form of *R. similis*.

The anal tufts of *R. vulgaris* and *macra* are shorter than in any other Danaid, the hairs white at the base and grey outwardly. In *R. juvena* and *longa*, they are nearly twice as long and grey throughout.

All the Enganese species of *Dunais* are distinguished by their elongate form. This is also the case with several groups of butterflies in the Celebes, as shown by Mr. Wallace.

#### Family SATYRIDÆ.

12. *LETHE EUROPA*, Fab. scarce.

13. *MELANITIS LEDA*, Linn. (*ismene*). My specimens were dark and nearly unmarked above, but of the usual shape. Both the ocellate and the non-ocellate forms were taken.

14. *MYCALESIS MINEUS*, Linn. Common.

#### Family ELYMNIADÆ.

15. *ELYMNIA DOLOROSA*, Butler, var. *ENGANICA*. A local form of

*Ellymnias panthera*, Java, resembling *dolorosa*, as described by Mr. Butler from Nias. The forewing, however, is scarcely paler outwardly, its lower angle generally suffused with reddish; the ocelli of the hindwing are placed in diffused pale spots. Underside with two or three minute ocelli on the forewing, and six on the hindwing the first nearly all white, the others blue with the outer end dark and the pupil white. The outer part of the wing is but slightly paler than the inner, and is not "stone yellow striated with blackish" as in *dolorosa*, but pale grey-brown with red strizæ similar to those of the base. *E. dolorosa* has the hindwing more strongly dentate than in *panthera*, with a decided tail, but in the Enganese form the tail is much less distinct than in *panthera*. I took only females. The sex of the type of *dolorosa* is not stated.

#### Family MORPHIDÆ.

16. *AMATHUSIA AMYTHAON*, Doubleday, var. *INSULARIS*. Above black, the disc glossed with blue in some lights up to the border of the hindwing, but not apically on the forewing, the marginal line white. The lilac band is somewhat intermediate between that of *A. portheus*, or *dilucida*, and that of *A. westwoodii*, tapering less than in the latter, extending down to the internal, and up to the upper median vein near the outer margin, very broad costally. Below, the extensive space beyond the middle striga of the hindwing almost to the submarginal line is dusky in both sexes, without the lilac gloss of the rest. On the forewing there is a smaller dusky patch chiefly costal, beyond the fifth striga. These dark spaces are scarcely visible in the allied forms. The underside seems generally darker than in *westwoodii*, the ocelli have broader dark borders, the tails are much broader and more marked with white than in any other variety; the anal black spots are touched with blue in both sexes.

The ochreous band of the female is narrow, bifid near its lower end, deeply incised outwardly along the middle median vein and partly enclosing a dark spot in its inner margin above the same vein.

One of the numerous local forms of *Amathusia amythaon*, which are by some held as species. I am unluckily unable to compare it with Felder's Javanese varieties. It differs from *portheus* and *dilucida* in the broad tails and narrower blue band. It is like Westwood's *amythaon* (now called *westwoodii*), of uncertain habitat, but the band is less tapering, broader outwardly, the tails much broader, and the outer margin of the forewing convex instead of concave.

#### Family APATURIDÆ.

17. *CUPHA ERYMANTHIS*, Drury.

18. *ATELLA ALCIPE*, Cramer. The specimens are quite normal. Herr Kheil mentions *Atella phalanta*, and not *alcippe*, as occurring in Nias, possibly a mistake.

19. *CYRESTIS PERIANDER*, Fabr. Resembles the Malaccan form (*themire*, Honrath), but still darker, much darker than the Tenasserim one, which is perhaps a distinct variety. I have not seen the Javanese form, but if Horsfield's drawing is correct, and the insect has only the single space between the two outermost ochreous bands white, *themire* may be considered a distinct species.

A common species in the high forest.

20. *PRECIS IDA*, Cramer. Only one taken.

21. *HYPOLIMNAS BOLINA*, Linn. The male is normal, the female infinitely variable. Occasionally it is not much unlike the male. Usually the bluish band across the forewing is obscure and there are traces of a reddish band from the disc of the forewing across the hindwing, with white discal spots beyond it. The white band across the forewing below is present or absent. Sometimes this form resembles *Danaïs pieterii* when flying. Mr. Woodford has given an interesting account of the variability of the female of this butterfly in the Solomon Islands.

22. *HYPOLIMNAS ANOMALA*, Wallace. My single male, taken at Malakoni, has only the costa and outer margin of the forewing purplish, with an outer-discal line of white spots on both wings, a submarginal line, and a few discal streaks. The hindwing has no white on the disc. No doubt the species is as variable in Engano as elsewhere.

23. *DOLESCHALLIA NIASICA*, Butler. I took two or three males which may be conspecific with the female described as *niasica*. They are much darker than males of *D. bisaltide*, the apex of the hindwing strongly suffused with black. Herr Kheil gives both *niasica* and *bisaltide* from Nias, apparently considering them distinct, but it is unlikely that two varieties so closely allied can be found together. I have recently taken typical *Doleschallia pratipa* and typical *polibete* in the same piece of jungle in Western Siam, but this is a case of two local forms overlapping at the limit of their ranges. The same is true of *Parthenos lilacinus* and *gambrisius* from Karenni to Lower Siam.

#### Family NYMPHALIDÆ.

24. *NEPTIS SOMA*, Moore, var. *MERIDIEI*. Smaller than the Indian variety, and darker below, the markings of the upperside somewhat smaller and less fuliginous.

25. *NEPTIS OMBALATA*, Kheil, var. *ENGANO*. Like the Nias form described by Herr Kheil, but on the upperside the subapical white spots are smaller and better separated, the two lines of submarginal lunules distinct, and the upper white band of the hindwing much narrower and more broken. The colour of the underside is a rich red-brown, and the black borders of the white bands are very conspicuous.

Family LYCÆNIDÆ.

*Subfamily Aphneainæ.*

26. *HYPOLYCENA THECLOIDES*, Felder. This butterfly occurs locally in the Nicobars and the Malay Peninsula, and seems to feed on some shore-plant. It seemed scarce in Engano.

27. *EOÖXYLIDES THARIS*, Hübner. Common in the forests of the interior. The specimens are smaller than Sumatran ones, with the inner black fascia of the underside obsolescent.

28. *BINDAHARA SUGRIVA*, Horsf. Only two males taken, both quite normal. Herr Kheil mentions *B. phocides* in his Nias list, probably by mistake. I have taken *sugrica* in Great and Kar Nicobar, and again in Java.

*Subfamily Deudoriginæ.*

29. *DEUDORIX EPIARBAS*, Moore. The cell of the forewing is touched with red in the female.

*Subfamily Lyceninaæ.*

30. *NACADUBA ARDATES*, Moore. Common.

31. *NACADUBA VIOLA*, Moore. Only one or two seen.

32. *NACADUBA PROMINENS*, Moore. Scarce.

33. *NACADUBA MACROPHTHALMA*, Felder. Scarce. None of these species are mentioned as occurring in Nias, but Herr Kheil's *Plebeius kupu* is apparently the female of *N. viola*.

34. *CATOCHRYSOPS STRABO*, Fab., var. *LITHARGYRIA*. I think the true *strabo* was also seen, and no doubt *C. pandava* and *cneius* also occur. These species all seem to feed on a leguminous plant growing on the sea-beach, and are found on many small islands. *Catochrysops pandava* is per-

haps the commonest butterfly of the Nicobars. Herr Kheil mentions only *C. strabo* and *cneius* from Nias, and also *C. kandarpa* (= *strabo*).

35. EVERES PARRHASIUS, Fab., (stated by Mr. de Nicéville to be the same as the European *argiades*). Only one or two seen. This is Herr Kheil's *Plebeius polysperchinnus*.

36. LAMPIDES BOCHUS, Cramer, (*Jamides bochus*). My specimens were identical with Indian ones. The species seems to vary but little throughout its range. The Nicobar form seems perfectly distinct, and should stand as *L. nicobaricus*, Wood-Mason and de Nicéville. Herr Kheil's *Plebeius siraha*, from Nias, is apparently the same as *L. bochus*, but why he should compare it with *Plebeius balliston* (*Lycaenesthes bengalensis*) I do not know.

37. LAMPIDES SUBDITUS, var. TELANJANG. Female. Above, with the inner border of the black outer area excised by an entering angle. Hindwing with the outer bluish rings bounded inwardly by a broad dark band which is suffused anally with reddish. Below, the submarginal pair of fasciæ diffused and lunular. Hindwing with the orange forming a large area discally, extending above the radial vein and to the submedian, only three of the black spots complete, the inner zigzag line obsolescent.

Only a single female taken, but *subditus* is so different from other species of *Lampides*, and this form is so distinct from *subditus*, that I have thought best to name it.

38. LAMPIDES ELPIDION, n. sp. A local form of *Lampides elpis*, the dark white-bordered submarginal spots of the hindwing separated from the basal blue by a broad unbroken dark wavy band: forewing with the blue pale and milky, the outer dark margin rather broad, the veins edged slenderly with black at the apex. Below the ground-colour is uniform pale reddish-brown, as in the dry season form of *elpis*. Prehensors as in *elpis*. I have compared this butterfly with a long series of Indian and with four Javanese males, and it seems a good local race, easily distinguished. It is very much larger than Herr Kheil's *Plebeius talinga*, which has the black border of the forewing much broader, and the inner band of the hindwing wanting.

39. LAMPIDES CELÆNO, Cramer. I identify this species with some doubt; a small pale-blue form, quite common along the shore. Another *Lampides*, which I have not been able to place, is pale grey above, with the border rather narrow on the forewing and reduced to a thread on the hindwing.

Herr Kheil describes a *Cyaniris* from Nias, *puspinus*, dubiously distinct from *C. puspa*. *Zizera karsandra* certainly occurs in Engano, but I do not seem to have taken it. Herr Kheil gives it in his Nias list under the name of *Plebeius lysimon*.

40. PITHECOPS HYLAX, Fab. Scarce.

Subfamily Gerydinæ.\*

41. PARAGERYDUS UNICOLOR, Felder, (*horsfieldii*, Moore). The identity of *horsfieldii* and *unicolor* seems generally accepted by the German naturalists, and Mr. de Nicéville, who has examined Felder's types (three females) of *unicolor* at Vienna, has come to the same conclusion.

*Paragerydus* certainly does differ considerably in aspect from *Allotinus*. I think it may be kept distinct from it for the present, on account of the approximate second and third subcostal branches in the forewing of the male.

Family PIERIDÆ.

42. TERIAS HARINA, Horsf. Only one taken. Herr Kheil does not record it from Nias.

43. TERIAS HECABE, Linn.

44. TERIAS SARI, Horsf. Taken only on the hills.

45. APPIAS HIPPO, Cramer. Only females taken. It may be the Javanese *Appias lyncida*, and not *hippo*.

46. HUPHINA ETHEL, n. sp. Male, above white, all the veins, including the internal and medians, black, and bordered with diffused black scales, the cell and the upper median vein heavily bordered with black, the costa tinged with lemon. Outer border rather widely and equally black, a dark, diffused outer-discal band parallel with the margin as far as the internal vein, cutting off seven submarginal spots, all white except the first, which is bright yellow, slender, the last large and out-

\* In the 1889 volume of this Journal, by an unfortunate blunder I described the fore tarsi of the *Gerydinæ* as like the middle and hind ones, in spite of my numerous drawings showing the contrary. I also gave Herr Kheil's *Allotinus aphocha* as equivalent to *horsfieldii*. *A. aphocha* may be distinct, though badly described, and figured only on the underside, where it is identical with *horsfieldii*. I now doubt if my proposed genus *Malais* is distinct from *Logania*, though a Bornean form resembling *L. sriwa* does have the tibiae short and thick.

wardly incised. *Hindwing*, rich ochreous yellow, (without any orange tinge) from the first subcostal vein to the hind margin; the outer border rather widely black (but not subanally), the outer part of the veins, except the submedian and especially the subcostals and radial, also black, bordered with diffused scales. *Below*, the white area is reduced on the forewing, the upper submarginal spots united in a large triangular bright yellow mass, only the lower two white, that above the upper median vein obsolescent. *Hindwing* lemon yellow, ochreous yellow on the extreme anal margin, with greenish areas above and below the cell, especially around the subcostal veins; the dark brown border very wide, attaining the cell, enclosing six yellow spots, all large except the fourth which is obsolescent, the first three more or less united.

The absence of all orange on the wings, the submarginal band of the forewing, the veins outlined with black on both wings, the very broad marginal dark band of the hindwing below, and the large extent of the yellow area, tinged with greenish below, easily distinguish this peculiar species from *Euphonia lea* and *judith*.

Only one male, taken at Bua Bua.

#### Family PAPILIONIDÆ.

47. ORNITHOPTERA NEREIS, n. sp. A local form of *O. pompeius*, Cramer. Male. Above, black, the cell immaculate, the veins of the disc black, bordered with rather conspicuous whitish rays. *Hindwing* golden yellow, bordered with a deeply scalloped black band, which is only about  $\frac{1}{10}$  of an inch wide at the ends of the veins, the base black above the middle of the costal space, including the root of the cell; two (in one specimen five) black discal spots subanally in the gold. *Below*, the white streaks near the veins are more continuous, and the end of the cell is slightly touched with whitish; a little red at the base of the wings.

*Female*, with the outer third of the cell entirely dull whitish, the whitish streaks between the veins coalescing, and extending nearly to the outer margins, the black rays in the middle of the spaces not nearly reaching the cell; hindwing very dull golden, the border wide, the discal spots coalescing widely with each other and with the outer black band, so as to enclose small yellowish lanceolate spots in pairs divided by the veins. *Below*, the hindwing is dull pale whitish-yellow, without any golden tint; this area extends only to the upper subcostal vein and occupies two-thirds of the cell. Several males and two females were taken, but one of the latter was unluckily destroyed, and the other is worn.

This species seems nearest the South Indian *Ornithoptera minos*.

Herr Kheil calls the Nias form *O. amphrysus*, Cramer, but it seems unlikely that a Javan species should occur in Nias and not in Engano. *O. nereis* obviously differs from *amphrysus* in the absence of the yellow band across the forewing of the male. The opaque whitish-yellow of the underside of the female is a striking character, and distinguishes it from a Philippine form, which otherwise resembles it considerably, especially in the male sex.

48. *PAPILIO* (MENELAIDES) *ARISTOLOCHÆ*, Fab. Only one specimen taken; it was quite small. The species seems wanting on the opposite coast of Sumatra, being apparently replaced by *Papilio antiphus*.

49. *PAPILIO* (ILIADIS) *OCEANI*, n. sp. A local form of *Papilio memnon*, from Java. Male, above like *memnon*, but the lines of luteous scales on the forewing are nearly obsolete (slightly visible near the apex), and those of blue scales on the hindwing less conspicuous, and not nearly reaching the cell. Below, the red basal areas are wholly wanting, and the outer grey area much narrower, not at all enclosing the series of large black spots.

*Female*, forewing above heavily marked with pale luteous bands bordering the dark veins over the whole disc, entering the upper end of the cell, black rays in the middle of the spaces, the apex darker. Hindwing similar but with the luteous bands less conspicuous, enclosing a series of large black spots. Below, the red basal spots are present, but very small, the grey border slightly broader than in the male.

The absence of the red basal spots above and below in the male, above in the female, the obsolete markings of the upperside of the male, and the narrow band of the hindwing below in both sexes, easily distinguish this species from its allies.

Only one male and one female taken.

50. *PAPILIO* (CHARUS) *HELENUS*, Linn. var. *ENGANIUS*. The lines of luteous scales are conspicuous above and below, more or less whitish near the lower angle of the forewing; the red lunules of the upperside are absent, except the anal one, which is obscure. Below, the white area is large, the marginal white lunules are distinct, the submarginal orange ones small and obscure, wanting in the lower radial and upper median spaces, giving the insect somewhat the appearance of *Papilio prexaspes*; the female has a diffused white spot on each side of the radial vein.

51. *PAPILIO* (ZETIDES) *AGAMEMNON*, Linn. One tattered male, Bua Bua.

52. *PAPILIO* (ZETIDES) *SARPEDON*, Linn.



## Family HESPERIADÆ.

53. *HASORA BADRA*, Moore. Two males and a female taken, normal.

54. *PADRAONA PALMARUM*, Moore, var. *KAYAPU*. The black area beyond and below the cell of the forewing is nearly obsolete, the yellow band of the hindwing very wide. This is perhaps a distinct species, but as only one male was taken, I cannot be sure.

55. *CHAPRA MATHIAS*, Fab.

56. *UDASPES FOLUS*, Cram.

57. *HIDARI IRAYA*, Moore. One male.

58. *TAGIADES ATTICUS*, Fab. The two hyaline spots below the three subapical ones are absent in the male, the two at the end of the cell are joined in the female. The white area of the hindwing is very large in both sexes, extending to the outer margin, where there are three black spots.

## EXPLANATION OF PLATE 1.

Fig. 1. *Danais pietersii*, n. sp.

„ 2. *Radena longa*, n. sp.

„ 3. *Danais chrysea*, n. sp.

„ 4. *Radena macra*, n. sp.

Figs. 5-8 refer to Mr. Doherty's other paper.

III.—*New and Rare Indian Lycænidae*.—By WILLIAM DOHERTY, Cincinnati, U. S. A. Communicated by the NATURAL HISTORY SECRETARY.

[Received 9th March 1891 :—Read 6th May, 1891.]

(With Plate I, Figs. 5-8.)

## Family LYCÆNIDÆ.

Subfamily *THECLINÆ*.

1. *ARHOPALA KHAMTI*, n. sp. Pl. I, Fig. 5.

Near *A. aënea*, Hew., differing in the dark, dull indigo-blue of the upperside, and the darker shade of the underside, with the terminal cell-spot remote from that in the lower median space of the forewing; hindwing with a large subanal ocellus bordered with metallic green, which

extends to the lower median vein; a dark spot edged with whitish in the lower median space. Lobe and tail large.

Margherita, Upper Assam.

2. *FLOS AHAMUS*, n. sp. Pl. I, Fig. 6.

Female, like *Flos asoka*, but with the blue of the upperside pale, slightly virescent outwardly, not reaching up to the upper radial vein. Below, forewing with the transverse fasciæ much duller, and more regular, those in the interno-median space of the forewing obscure. Hindwing with the pale basal stripe absent, the base all dark, touched with scarlet costally; the lower half of the wing very dark, especially subabdominally, the markings there obscured; beyond the dark base there is a broad lilac area transversely from the costa to the hind-margin, containing a sinuous irregular band from the costa to the median vein, continued by a small separate spot in the interno-median space; no other metallic markings. The species also resembles the Himalayan form of *Flos fulgidus*, Hew., but obviously differs in the colour of the upperside; and on the underside in the whitish spot at the end of the cell of the forewing, which is narrow and conspicuous, (broad and dull in *fulgidus*); the lower part of the hindwing is much darker, and the pale costal band absent.

Margherita, Upper Assam.

3. *ACESINA ZEPHYRETTA*, n. sp.

Male, above dark brown, a small diffused light blue area occupying less than a sixth of the forewing, including part of the cell, the interno-median and the lower median space, extending just above the middle median vein, the veins dark; hindwing unmarked, the cilia whitish, especially apically. Below brown, slightly glossed with violet, except the spots, which are darker and encircled by broad whitish rings. There is no costal white spot on the hindwing, but the apex is chiefly whitish, the disc irrorated with whitish scales, the ocelli obsolescent.

This species, in which the male resembles a female, is obviously distinct, and seems to connect *A. paraganesa* with the other species of *Acesina*.

Margherita, Upper Assam.

4. *ACESINA ARIEL*, n. sp.

Male, above violet-blue (dull in some lights) over half of the hindwing, and rather more than half of the forewing, the blue areas rounded. Underside uniform brown, strongly glossed with violet, not irrorated with whitish scales, the markings annular, scarcely darker than the

ground-colour, with slender, pale violet-whitish rings; no costal white patch on the hindwing, the apex not whitish; three distinct subanal ocelli with metallic bluish-green irides. The violet hue of the upperside distinguishes it from *A. ammon* and *Ammonides*, as well as the entire absence of the costal white patch on the hindwing below.

Margherita, Upper Assam.

5. *ACESINA AMMONIDES*, n. sp. (= *ammon*, mihi, nec Hewitson).

The Tenasserim form of *A. ammon*, which I have now been able to compare with a specimen from Pahang (Malay Peninsula) kindly lent me by Mr. de Nicéville, and one from Perak, taken by myself, seems a good local race, which I distinguish by the above name. In *A. ammon* the blue is slightly tinged with violet (but much less than in *A. ariel*), and occupies less than half of the forewing and hardly more than a quarter of the hindwing. In *ammonides*, the blue is more azure in tint, extends well beyond the cell all around it, and occupies half of the forewing and half of the hindwing. Below, in *ammon* there is only the conspicuous white costal mark on the hindwing. In *ammonides*, the apices of both wings, especially the hindwing, are strongly suffused with whitish, and there are whitish scales abdominally on the hindwing, and a quadrate discal white spot between the lower two median veins. In one specimen of *ammonides*, the three minute ocelli of the hindwing are touched with metallic gold; *ammon* is without metallic scales.

Tenasserim valley.

Besides those above mentioned, I took the following species of this subfamily at Margherita, Upper Assam. *Zephyrus distortus* (*Zinaspia distorta*, de Nicéville), *Flos moellerii*, *Darasana perimuta* and *paramuta*, *Arhopala teesta*, *singla*, *centaurus*, *amantes*, *rama*, *anarte*, *belphebe*, *bazalus* and *camdeo*.

Subfamily *APHNÆINÆ*.

6. *DRINA MANEIA*, Hew.

The veins of the forewing are marked with raised lines of light-brown scales in the blue area, somewhat as in *Papilio ganesa* or *Argynnis childrenii*. The veins so marked are the three medians, the lower radial and the submedian, besides a line in the interno-median space, and two terminally in the cell. These are presumably scent-glands.

The venation agrees well with that of *Drina donina*, the type of the genus; so that Mr. de Nicéville, who had never seen the species, showed some acuteness in placing it here, in spite of its wholly different appearance.

Rare at Padang Rengas, Perak.

Genus *THRIX*, novum.

Male, forewing with the subcostal vein five-parted (including the vein itself as a branch), the first branch originating one-third before the end of the cell, the third a little before the end, the second nearer the first than the third, the fourth from the third halfway to the apex, the fifth close to the apex, very short. Discocellular veins nearly straight, the lower half again as long as the upper, cell slightly longest at its lower angle, second bifurcation of the median vein a little before its end. Submedian vein exceedingly remote from the median, straight for nearly half of its length, then bent downwards like a bow. In the interno-median space discally, there is a deep oblique depression on the upperside, covered with short grey down, and bearing a conspicuous extensile tuft of long orange hairs produced downwards and outwards over the depression. Hindwing with the two lower median branches forking simultaneously from the end of the cell; a long tail from the submedian, a short one from the lower median vein.

The curious scent-organ in the middle of the forewing of the male, resembling that of *Dacalana* and *Arrhenothrix*, has so distorted the venation that I have thought it advisable to separate this genus from *Neocheritra*. Whether the male has five and the female four subcostal branches, as in that genus, I do not know.

7. *THRIX GAMA*, Distant, (*Neocheritra gama*).

Above black, a tuft of orange hairs over a small grey cavity in the middle of the forewing. Hindwing with the lower part white, containing two black spots; above this grey, with three black spots on the boundary between the grey and the white; the upper part of the wing black. Below as in the female. The species apparently mimics *Eoöxylides tharis*.

Rare at Padang Rengas, Malay Peninsula. I have also taken it in the mountains of south-western Sumatra.

Subfamily *PORITINÆ*.

Genus *MASSAGA*, mihi. I find that in the male of *M. pediada*, the type of this genus, there is a narrow tuft of prostrate black hairs arising at the end of the cell, extending beyond it along the upper border of the upper median vein. This was pointed out to me in *M. pharyge* by Mr. de Nicéville and I afterwards found it in *M. pediada*. In *M. potina* it is apparently present, but very small and inconspicuous. In all these species the upper tuft is of considerable size, yellowish or whitish, turned upwards along the upper subcostal vein, in a large whitish patch. In\*

*Poritia*, the lower tuft is absent, the upper one black or dark brown, without the whitish patch.

#### Subfamily *LYCÆNINÆ*.

Genus *PHENGARIS*, novum. The splendid Chinese butterfly *Lycæna atroguttata*, Oberthür, deserves to be placed in a separate genus or subgenus, distinguished from *Lycæna* by the upper discocellular vein of the hindwing being short and angled outwardly, the lower discocellular meeting the median vein opposite its second forking.

This butterfly is certainly the finest of the subfamily, unless the *danis* group of *Cyaniris* be excepted. I was not able to detect any odour about it, but it has all the air of a protected species. I often saw it in the meadows of the Kutch Naga country, Naga Hills, from 6000 to 8000 feet elevation, flying very slowly and visible from a great distance, so that I caught a good number, in spite of its rarity. The character of its markings, round black spots on a pure white ground, is very remarkable. It is hard to avoid thinking *Tajuria maculata*, Hew. a mimic of this species, though it seems to live at a lower elevation, and further to the westward. *Taraka hamada* is somewhat similarly marked, and is obviously protected.

I have taken the name *Phengaris*, which means a daughter of the moon, from the modern Greek.

#### Subfamily *GERYDINÆ*.

##### 8. *GERYDUS HERACLEION*, n. sp.

Male, forewing less acute than in *G. symethus*, hindwing rounded. *Above*, brown, forewing with a slaty gloss, the apex darker, a broad oblique white band from the upper end of the cell and beyond it (above the cell it is obscure), almost to the middle of the interno-median space, the outer part dehiscent along the lower median vein, projecting furthest in the lower median space (unlike *symethus*). The band is much broader than in *Gerydus biggsii*, Distant, (*gopara*, de Nicéville). Hindwing all dark. *Below*, the white band of the forewing is obscure and broken, the spot in the lower median space quite separate from and more distinct than the rest, the transverse lunular band obsolescent in the forewing, three costal ring-spots, three small subapical lunules. Hindwing, much less clouded with blackish than in *G. croton*, the lunular transverse band nearly regular, the basal spots quadrate, the submarginal black dots very distinct.

Perak, Malay Peninsula.

The species is larger than *G. symethus*, not quite so large as *G. ancon*. The upper median vein of the male is naked above and swollen from the end of the cell one-fourth towards the outer margin. This may be regarded as a generic character of *Gerydus*, since it occurs at any rate in *G. symethus*, *biggsii*, *boisduvalii*, *heracleion*, *irroratus* var. *assamensis*, and *ancon*. In *G. croton* the swelling is indistinct, and the vein is covered with black scales.

9. *GERYDUS IRRORATUS*, Druce, var. *ASSAMENSIS*, nov. Pl. I. Fig. 7.

Above, unmarked except by a small, pale, longitudinal area around the base of the upper median vein on the forewing. Below, pale grey-brown, without the dark markings of *G. boisduvalii*, a small pale area on the forewing below the middle median vein, the markings lunular, those in the cell of the forewing reduced, the transverse discal band of the forewing subapical, extending only to the upper median vein, a single conspicuous dark lunule near the lower angle; the transverse band of the hindwing regular, an undulated, continuous submarginal dark line.

Dhansiri Valley, Naga Hills.

It resembles *G. melanion* from the Philippines, but is without the white area near the lower angle of the forewing above. It may be conspecific with Mr. Druce's *G. irroratus* (from Siam) which has never been figured or properly described.

I have taken what may be the female of *Gerydus irroratus* in Perak. Some pale markings represent the broken white band of *G. boisduvalii*, the hindwing is angled at the upper median vein.

The figure represents the transverse band of the hindwing incorrectly; it is really composed of separate annular lunules.

10. *LOGANIA MASSALIA*, n. sp., Pl. I, Fig. 8.

Female. Above black, a round, dull white discal area on the forewing from just above the upper median vein almost to the submedian vein. Below irregularly speckled and variegated; forewing with the costal and apical parts ochreous-brown, the rest blackish. Hindwing also tinged with ochreous, a submarginal dark area, and obscure dark transverse bands. Hindwing not angled, the margin entire.

Nearest an undescribed *Logania* from Perak, Malay Peninsula, which, however, has the upperside marked as in *L. marmorata*, and the margin undulated,

Margherita, Upper Assam.

\* EXPLANATION OF PLATE I.

Fig. 5. *Arhopala khamti*, n. sp. (Assam.)

Fig. 6. *Flos ahamus*, n. sp. (Assam.)

Fig. 7. *Gerydus irroratus*, Druce, var. *assamensis*, var. nov. (Assam.)

Fig. 8. *Logania massalia*, n. sp. (Assam.)

Figs. 1—5 refer to the previous paper on the Butterflies of Engano.

IV.—*Materials for a Flora of the Malayan Peninsula*.—By GEORGE KING, M. B., LL. D., F. R. S., C. I. E., Superintendent of the Royal Botanic Garden, Calcutta. No. 3.

. (Continued from page 206 of Vol. LIX of 1890.)

[Received 2nd March 1891. Read April 1st 1891.]

In the arrangement of the Natural families which is being followed in these papers (that of DeCandolle as modified by the late Mr. Benthams and Sir Joseph Hooker), the family *Dipterocarpeae* should have preceded *Malvaceae*. Delays have, however, occurred in the elaboration of that family; and, rather than postpone the publication of the remaining three *Thalamifloral* orders, I have decided to submit my account of these to the Society now, deferring my paper on the *Dipterocarpeae* and on the previously omitted *Anonaceae* to a future occasion.

ORDER XVII. MALVACEÆ.

Herbs, shrubs or trees; herbaceous portions often stellate-hairy or scaly. *Leaves* alternate, palminerved, simple, lobed, or rarely compound. *Stipules* free, sometimes caducous. *Bracteoles* 3 or more, free or combined, often forming an epicalyx. *Flowers* axillary or terminal, solitary, fascicled or cymose-paniculate, regular, hermaphrodite or 1-sexual. *Sepals* 5, valvate, free or connate. *Petals* 5, twisted-imbricate. *Stamens*  $\infty$ , rarely definite, adnate to the base of the petals; filaments monadelphous, forming a tube; anthers oblong or reniform, cells sinuous or twisted, linear or annular, ultimately 1-celled bursting longitudinally. *Ovary* 2-many-celled, entire, or lobed, of 2-5 or usually more carpels whorled round a central axis; styles connate below or throughout their length; ovules 1 or more, curved, attached to the inner angle of each carpel. *Fruit* of dry cocci, or capsular and loculicidal, often large and woody. *Seeds* reniform or obovid, sometimes arillate; albumen scanty, often mucilaginous or 0; embryo curved; cotyledons leafy, usually

folded or crumpled.—Distrib. Abundant in warm regions, common in temperate, absent from arctic. Genera 57; known species about 700.

A. Staminal tube entire, or but slightly divided at the apex.

Tribe I. *Malvææ*. Herbs or shrubs. *Ripe carpels* separating from the axis. *Styles* as many as the carpels.

Ovules solitary; carpels with convergent, often

beaked, apices ... 1. *Sida*.

Ovules 2 or more; carpels with divergent, not

beaked, apices ... 2. *Abutilon*.

Tribe II. *Urenææ*. *Styles or stigmatic branches* twice as many as the carpels.

Fruit of indehiscent cocci ... 3. *Urena*.

Tribe III. *Hibiscææ*. Herbs or shrubs. *Fruit* capsular. *Sepals* leafy. *Staminal-tube* truncate or 5-toothed at the apex.

Calyx toothed: stigmas distinct, spreading ... 4. *Hibiscus*.

„ truncate: stigmas united ... 5. *Thespesia*.

B. Staminal tube short or divided into single filaments to its base.

Tribe IV. *Bombaciææ*. Trees. *Sepals* leathery: styles connate or free. *Fruit* capsular.

Leaves digitately compound, calyx truncate or irregularly 3 to 5-lobed; seed silky outside.

Anthers solitary ... 6. *Bombax*.

„ in groups of 2 or 3 ... 7. *Eriodendron*.

Leaves simple, usually scaly; fruit woody, mucate; seeds arillate.

Calyx tubular or bell-shaped.

Anthers linear, cells sinuous ... 8. *Durio*.

Anthers globose, opening by a pore ... 9. *Boschia*.

Calyx dilated at the base.

Calyx finally forming a cushion-shaped annulus ... 10. *Neesia*.

Calyx 5-pouched at the base, petals inserted on the calyx ... 11. *Oelostegia*.

# 1. *SIDA*, Linn.

Herbs or undershrubs. *Leaves* entire or lobed. *Bracteoles* 0. *Calyx* of 5 valvate sepals, tubular below. *Corolla* of 5 petals, free above, connate below and adnate to the tube of the stamens. *Staminal-tube* dividing at the summit into numerous anther-bearing filaments. *Carpels* 5 or more, whorled; styles as many as the carpels, stigmas terminal.



*Ripe carpels* separating from the axis, generally 2-awned at the summit, and dehiscing irregularly or by a small slit. *Seed* solitary, pendulous or horizontal; radicle superior.—Distrib. A genus of about 80 species, most of them being tropical weeds.

1. *S. MYSORENSIS*, W. & A. Prod. I, 59. A sub-erect, sometimes decumbent, herb 1 to 2 feet high, covered with more or less glutinous hairs. *Leaves* cordate-ovate, acuminate, coarsely serrate-crenate, 1·5 to 2·5 in. long and 1 to 1·5 in. broad; petiole about half as long as the blade. *Stipules* linear, less than half as long as the petiole. *Flowers* less than ·5 in. in diam., in few-flowered axillary racemose cymes, corolla yellow; pedicels shorter than the petioles, jointed near the middle. *Carpels* shorter than the calyx, sub-glabrous, each with a short awn, or awnless. Mast. in Hook. fil. Fl. Br. Ind. I, 322; Thwaites Enum. 28. *S. hirta*, Wall. Cat. 1855, not of Lam. *S. urticæfolia*, W. & A., l. c. *S. nervosa*, Wall. Cat. 1853 E. *S. olens*, Ham. in Wall. Cat. 1874. *S. glutinosa*, Roxb. Hort. Beng. 97; Fl. Ind. iii, 172; Wall. Cat. 1855, not of Cav. *S. tenax*, Ham. in W. & A. Prodr. i, l. c.; Wall. Cat. 1855, E. F. *S. fasciculiflora*, Miq. Fl. Ind. Bat. i, Pt. 2, 140. *S. radicans* Cav. Diss. i, 8; W. & A. Prod. i, 59.

A weed by roadsides; in Perak and probably in the other provinces. Distrib. India, Java.

2. *S. CARPINIFOLIA*, L. An undershrub 2 to 3 feet high; glabrous or sub-glabrous; a few minute stellate hairs on the stems and petioles. *Leaves* linear-lanceolate, acute, serrate, 2 to 3 in. long and ·25 to ·35 in. broad; petioles ·1 to ·2 in. *Stipules* subulate, nerved, much longer than the petiole. *Flowers* ·5 in. in diam, solitary, axillary; corolla yellow, peduncles as long as the petiole, jointed, minutely bracteolate. *Carpels* shorter than the sub-globose ribbed calyx, glabrous, rugulose, each with 2 short awns. DC. Prod. i. 460. Mast. in Hook. fil. Fl. Br. Ind. i. 323; Wall. Cat. 1871. *S. acuta*, Burm.; Cav. Diss. i p. 15, t. 2, f. 3; DC. Prodr. i. 461; Wall. Cat. 1868, 1, 2, 3, 4, 5; Roxb. Fl. Ind. iii. 171; W. & A. Prodr. i. 57; Dalz. & Gibs. Bomb. Fl. 17; Thwaites Enum. 27; Miq. Fl. Ind. Bat. i. Pt. 2. p. 143; Wight Ic. t. 95; Bl. Bijdr. 55; Wall. Cat. 1868 G. *S. lanceolata*, Roxb. l.c. 175; Wall. Cat. 1868 F. *S. stipulata*, Cav. Diss. i. t. 3, f. 10; DC. Prodr. i. 460; W. & A. Prodr. l.c. *S. Stauntoniana*, DC. l.c.; *S. scoparia*, Lour. ex W. & A. lc.

In all the provinces as a weed. Distrib. India and Tropics generally.

3. *S. RHOMBIFOLIA*, Linn. sp. 961. An erect under shrub 2 to 3 feet high, from glabrous to hoary, stellate-pubescent. *Leaves* varying

from ob-lanceolate or obovate to rhomboid, but always with tapering bases, serrate to crenate; under surface hoary, rarely green; length .5 to 2.5 in., petiole .1 to .2 in. *Stipules* setaceous, longer than the petioles. *Flowers* .5 in. in diam., axillary, solitary; corolla yellow, rarely white; peduncles much longer (sometimes six times) than the petioles, variously and sometimes indistinctly jointed, ebracteolate. *Carpels* smooth or pubescent, or reticulate, each usually with 1 or 2 rather long awns, sometimes awnless, generally longer than the calyx. *Mast.* in Hook. fl. Fl. Br. Ind. i. 323; *Miq.* Fl. Ind. Bat. i. pt. 2. p. 142; *DC.* Prodr. i. 462; *Roxb.* Fl. Ind. iii. 176; *Wall.* Cat 1862, 2; *Thwaites* Enum. 28. *S. canariensis*, Willd.; *DC.* Prodr. i. 462. *S. compressa*, *Wall.* Cat. 1866; *DC.* Prodr. i. 462.

This very polymorphic species has been divided into varieties by Dr. Masters in Hooker's Fl. Br. Ind. l.c. as follows:—

"Var. 1. *scabrida*, W. & A. Prodr. i. 57 (sp.); sprinkled with rigid hairs, leaves concolorous, peduncles joined at the base, carpels awned.

"Var. 2. *retusa*, Linn. (sp.); leaves obovate retuse hoary underneath, peduncles equalling the leaves jointed above the middle, carpellary awns short.—*Cav.* Diss. i. t. 3, f. 4, and Diss. v. t. 131, f. 2; *Bl.* Bijdr. 75; *W. & A.* Prodr. i. 38; *Wall.* Cat. 1870; *DC.* Prodr. i. 462; *Roxb.* Fl. Ind. iii. 175; *Dalz. & Gibs.* Bomb. Fl. 17; *Miq.* Fl. Ind. Bat. i. pt. 2, 142. *S. chinensis*, *Retz* ex *Roxb.* Hort. Beng. 97; *Fl.* Ind. iii. 174. *S. philippica*, *DC.* Prodr. i. 462; *W. & A.* Prodr. l.c.; *Wall.* Cat. 1869; *Rheede* Hort. Mal x. 18; *Rumph.* Amb. v. t. 19.—The *S. corynocarpa*, *Wall.* Cat. 1870, seems to be a form of this variety, with densely intricate woody branches, and long carpellary awns.

"Var. 3. *rhomboidea*, *Roxb.* Hort. Beng. 50; *Fl.* Ind. iii. 176 (sp.); leaves rhomboid hoary beneath, peduncles jointed at the base, carpellary awns very short inflected. *DC.* Prodr. i. 462; *W. & A.* Prodr. i. 57, *Wall.* Cat. 1862 B., 1863; *Thwaites* Enum. 28. *S. rhombifolia*, *Wall.* Cat. 1862 F. ? *S. orientalis*, *Cav.* Diss. i. t. 12.—The flowers expand at noon (*Roxb.*).

"Var. 4. *obovata*, *Wall.* Cat. 1864 (sp.); leaves  $1\frac{1}{2}$  by 2 in., broadly obovate, hoary beneath, apex coarsely toothed, base cuneate, petiole  $\frac{1}{4}$  in., peduncle longer than the petiole shorter than the blade.

"Var. 5. *microphylla*, *Cav.* Diss. i. t. 12, f. 2 (sp.); leaves small, elliptic dentate hoary beneath, peduncle slightly exceeding the petiole, carpels 5-7 awned.—*Roxb.* Fl. Ind. iii. 170; *DC.* Prodr. i. 461."

\* In all the provinces—a common weed. Distrib. The Tropics generally.

2 to 3 feet high, the hairs on the branches and petioles long and spreading. *Leaves* oblong-cordate, obtuse, rarely acute, crenate; both surfaces, but especially the pale lower surface, softly hairy; length 1·25 to 2 in., breadth ·8 to 1·25: petiole slightly longer than the blade. *Stipules* linear, less than half the length of the petiole. *Flowers* ·6 in. in diam., axillary, solitary; corolla yellow; peduncles jointed near the apex, varying in length, the lower longer, the upper shorter, than the petioles. *Carpels* boldly 3-angled, reticulate, sub-glabrous, crowned by 2 strong, divergent, retro-hispid awns. DC. Prod. i. 464, Roxb. Fl. Ind., iii. 177; Wall. Cat. 1849; W. & A. Prodr. i. 58; Thwaites Enum. 28. Dalz. & Gibs. Fl. Bombay, 17; Mast. in Hook. fil. Fl. Br. Ind. i. 324, and in Oliver's Fl. Trop. Afr. i. 181; Miq. Fl. Ind. Bat. i. pt. 2, 140. *S. herbacea*, Cav. Diss. i. 19, t. 13, f. 1; DC. Prodr. i. 463. *S. micans*, Cav. Diss. i. 19, t. 3, f. 1. *S. rotundifolia*, Cav. Diss. i. 20, t. 3, f. 6, and Diss. vi. t. 194, f. 2; Wall. Cat. 1849, D; DC. Prodr. i. 464. *S. althæifolia*, Swartz, Guill. & Per. Fl. Seneg. i. 73.—Rheede Hort. Mal. x. t. 54.

In Malacca: and probably in all the Provinces as a weed. Distrib. The Tropics generally.

## 2. ABUTILON, Gärtn.

Herbs or undershrubs more or less covered with down. *Leaves* angled or palmately-lobed. *Inflorescence* axillary or terminal. *Bracteoles* 0. *Calyx* of 5 valvate sepals, tubular below. *Corolla* of 5 petals, free above, connate below and adnate to the tube of the stamens. *Staminal-tube* divided at the apex into numerous filaments. *Carpels* 5-8. Styles as many as the carpels. Ripe *carpels* separating from the axis, awned or not, 1- or more-seeded. *Seeds* reniform. Distrib. About 70 species, all tropical or subtropical.

A. INDICUM, G. Don. Gen. Syst. i. 504. An annual or perennial undershrub. *Leaves* broadly cordate, irregularly and coarsely toothed or sub-entire, pale and minutely pubescent on both surfaces, often with a few longer hairs intermixed, length 1 to 2 in., breadth. 1 to 2 in.; petiole usually longer than the blade. *Flowers* 1 in. in diam, axillary, solitary, the peduncles longer than the petioles, jointed near the top; corolla yellow. *Sepals* ovate, acute, shorter than the spreading petals. *Carpels* 15 to 20, longer than the calyx, truncate or with short spreading awns, tomentose at first, ultimately sub-glabrous. *Seeds* dark brown, minutely stellate-hairy. Mast. in Hook. fil. Fl. Br. Ind. i. 326; *A. asiaticum*, W. & A. Prodr. i. 56, not *Sida asiatica*, Linn.; W. & A. Prodr. i. 56; Wight Ic. t. 12; Dalz. & Gibs. Bomb. Fl. 18; Thwaites Enum. 27; Mast. in Oliv. Fl. Trop. Afr. i. 186; Miq. Fl. Ind.

Bat. i. pt. 2, 146. *Sida indica*, L.; DC. Prodr. i. 471; Cav. Diss. i. p. 33, t. 7, f. 10; Roxb. Fl. Ind. iii. 179; Wall. Cat. 1859, 1, 2, D. F. *Sida populifolia*, W. & A. l.c. *A. populifolia*, G. Don. l.c. *Sida populifolia*, DC. Prodr. i. 470; Cav. Diss. i. t. 7, fig. 9; Roxb. Fl. Ind. iii. 179; Bl. Bijdr. 79. *S. Beloere*, L'Her. Stirp. i. 130. *S. Eteroomischos*, Cav. Diss. ii. 55 and v. p. 275, t. 128.

Singapore, Selangore and probably in all the other provinces. A weed.

### 3. URENA, Linn.

Herbs or undershrubs, more or less covered with rigid stellate hairs. *Leaves* angled or lobed. *Flowers* clustered. *Bracteoles* 5, adnate to the 5-cleft calyx, sometimes coherent at the base into a cup. *Petals* 5, often tomentose at the back, free above, connate below and united to the base of the tube of the stamens. *Staminal-tube* truncate or minutely toothed. *Anthers* nearly sessile. *Ovary* 5-celled, cells 1-ovuled, opposite the petals; stigmatic branches 10; stigmas capitate. *Ripe carpels* covered with hooked bristles or smooth, indehiscent, separating from the axis when ripe. *Seed* ascending; cotyledons bent and folded; radicle inferior. Distrib. Species 4-5, natives of tropical and sub-tropical countries, 2 only being confined to Asia.

*U. LOBATA*, Linn. Spec. 974. A herbaceous undershrub 1 to 3 feet high, more or less hairy. *Leaves* very variable; the lower rotund to reniform, more or less cordate at the base, the apex usually acute, edges with 5 to 7 shallow lobes or sub-entire, 5 to 7-nerved; length 1 to 2 in., breadth 1 to 2.5 in.; upper leaves smaller and sometimes ovate to linear-lanceolate, 3-nerved. *Petiole* shorter than the blade; bracteoles oblong-lanceolate, as long as the sepals. *Corolla* pink, .5 to 1 in. in diam. *Carpels* tomentose, and with many smooth hooked spines. *Mast.* in Hook. fl. Fl. Br. Ind. i. 329; Miq. Fl. Ind. Bat. i. pt. 2, p. 149; Cav. Diss. iv. p. 336, t. 185, fig. 1; Miq. Pl. Jungh. 283; DC. Prodr. i. 441; Roxb. Fl. Ind. iii. 182; W. & A. Prodr. i. 56; Wall. Cat. 1928; Dalz. & Gibs. Bomb. Fl. 18; Thwaites Enum. 25; Miq. Fl. Ind. Bat. i. pt. 2, 148. *U. cana*, Wall. Cat. 1930 B. *U. palmata*, Roxb. Fl. Ind. iii. 182. *U. tomentosa*, Bl. Bijdr. 65.

All the Provinces: a weed. Distrib. The tropics generally.

Var. 1. *sinuata*, Miq. Fl. Ind. Bat. l.c.; leaves deeply 5-lobed, the lobes narrowed at the base, serrate, often pinnatifid, bracteoles linear; flowers often smaller than in the typical plant. *U. sinuata*, Linn.; DC. Prodr. i. 441; Roxb. Hort. Beng. 50; Fl. Ind. iii. 182; Wall. Cat. 1933 E.; W. & A. Prodr. i. 46; Hook. Fl. Br. Ind. i. 329; Thwaites Enum.

Pl. Cey. 25; Dalz. & Gibs. Bomb. Fl. 18. *U. muricata*, DC. Prodr. i. 442. *U. Lappago*, DC. Prodr. i. 441. *U. morifolia*, DC. Prodr. i. 442? *U. heterophylla*, Smith in Rees' Cycl. 37; Wall. Cat. 1933 E, F, G, H, K. *U. tomentosa*, Wall. Cat. 1933 H.;—Burm. Zeyl. t. 69, f. 2.

Distributed like the last.

Var. 2. *scabriuscula*, DC. Prodr. i. 441 (sp.); herbaceous; leaves roundish, scarcely lobed, with 1-3 glands beneath; bracteoles linear, longer than the sepals. *U. scabriuscula*, Wall. Cat. 1928 F; W. & A. Prodr. i. 46; Dalz. & Gibs. Bomb. Fl. 18.

#### 4. HIBISCUS, Linn.

Herbs, shrubs, or trees. *Leaves* stipulate, usually more or less palmately-lobed. *Inflorescence* axillary, rarely terminal. *Bracteoles* 5 or more, free, or connate at the base. *Calyx* 5-toothed or 5-fid, valvate, sometimes spathaceous. *Petals* 5, connate at the base with the staminal-tube. *Staminal-tube* truncate or 5-toothed at the summit; filaments many; anthers reniform, 1-celled. *Ovary* 5-celled, cells opposite the sepals, each with 3 or more ovules; styles 5, connate below; stigmas capitate or sub-spathulate. *Capsule* loculicidally 5-valved, sometimes with a separate endocarp, or with false dissepiments forming a spuriously 10-celled fruit. *Seeds* glabrous, hairy or woolly. About 150 species; distributed chiefly in the tropical regions of both hemispheres.

Calyx spathaceous, deciduous ... 1. *H. Abesmoschus*.

Calyx persistent, 5-cleft.

Bracteoles of involucre distinct, their

apices spatulate ... 2. *H. Surattensis*.

Bracteoles united at the base, nearly as

long as the calyx ... 3. *H. macrophyllus*.

Bracteoles united into a cup much shorter than the calyx.

Involucre and calyx softly pubescent 4. *H. tiliaceous*.

" " rugulose 5. *H. floccosus*.

1. *H. ABELMOCHUS*, Linn. Spec. 980. A stout annual under-shrub 2 to 3 feet high: young branches and peduncles retro-hispid, all other parts hispid or stellate-hispid. *Leaves* variable, usually with 3 to 5, deep, oblong-lanceolate or linear, serrate-crenate, acute lobes, sometimes hastate or sagittate, the base always rounded; length and breadth 3 to 5 in.; petiole longer than the blade: stipules minute, subulate, fugaceous. *Flowers* 3 in. in diam., axillary, solitary; peduncles shorter than the petioles, ebracteate. *Involucres* 8 to 12, linear, .5 to .75 in. long. *Calyx* 1.25 in. long, toothed at the apex. *Corolla* yellow with a crimson

centre, glabrous. *Capsule* oblong, pointed, hispid, becoming sub-glabrous, 1 to 3 in. long. *Seeds* reniform, striate, glabrous, musky. *Mast.* in Hook. fil. Fl. Br. Ind. i. 342 (excl. syn. *H. sagittifolius*, Kurz.); DC. Prod. i. 452; Roxb. Fl. Ind. iii. 202; Griff. Not. iv. 521. *Abelmoschus moschatus*, Mönch; W. & A. Prod. i. 53; Wight Ic. t. 399; Wall. Cat. 1915, F, G, H, I, K, L; Thwaites Enum. 27; Miq. Fl. Ind. Bat. i. pt. 2, 151. *H. flavescens*, Cav. Diss. iii. t. 70, f. 2; DC. l.c. 454. *H. spathaceus*, Wall. Cat. K. *H. ricinifolius*, Wall. Cat. 1915. *Bamia chinensis*, Wall. Cat. 1616? *Hibiscus pseudo-abelmoschus*, Bl. Bijdr. 70. *H. longifolius*, Willd. Spec. iii. 827; DC. Prod. i. 450. *Bamia multiformis* and *betulifolia*, Wall. Cat. 1917 and 1918.

In all the Provinces; cultivated or naturalised. Distrib. the tropics generally.

2. *H. SURATTENSIS*, Liun. Spec. 979. A weak straggling under-shrub; the branches, petioles and peduncles with small recurved prickles and a few soft spreading pale hairs. *Leaves* palmately 3 to 5-partite, rarely ovate, sub-entire, serrate, sparsely pilose; length and breadth 1.5 to 3 in.; petiole slightly longer than the blade. *Stipules* broadly ear-shaped. *Flowers* 2 to 2.5 in. long, solitary, axillary, corolla yellow with dark centre; bracts of involucre 10 to 12, linear with spatulate apices. *Capsules* membranous, the individual carpels with 3 bold aculeate nerves and a long terminal point. *Seeds* with long straight brittle yellowish hairs. *Mast.* in Hook. fil. Fl. Br. Ind. i. 334; Miq. Fl. Ind. Bat. i. pt. 2, 161; Bl. Bijdr. 68; DC. Prodr. i. 449; W. & A. Prodr. i. 48; Roxb. Fl. Ind. iii. 205; Wight Ic. t. 197; Cav. Diss. iii. t. 53, f. 1; Thwaites Enum. 26; Wall. Cat. 1893, 1, 2, 3, D, E, F, G; Dalz. & Gibs. Bomb. Fl. 20; *Mast.* in Oliv. Fl. Trop. Afr. i. 201; Miq. Fl. Ind. Bat. i. pt. 2, 161. *H. furcatus*, Wall. Cat. 1896 C, not of Roxb.

Malacca, Perak, and probably in the other Provinces. Distrib. The tropics generally.

This has a decumbent or even climbing habit.

3. *H. MACROPHYLLUS*, Roxb. Hort. Beng. 51. A large shrub or small tree, all parts more or less covered with pale soft minute velvety tomentum; the young branches, petioles, pedicels, bracteoles and calyx bearing, in addition, numerous more or less deciduous tufts of long spreading stiff tawny hairs. *Leaves* large, on long petioles, cordate-orbicular to reniform, the apex shortly sharply and abruptly acuminate, the edges entire; palmately 7 to 9-nerved; length and breadth 7 to 12 in.; petiole usually longer than the blade. *Stipules* oblong, convolute, hispid-tomentose, 3 to 4 in. long. *Flowers* in terminal cymes, pedicels

1·5 to 2 in. long, articulate near the apex and bearing two large broadly ovate deciduous bracts. *Involucres* of the individual flower 10 to 12, linear-lanceolate, connate at the base, as long as the calyx, hispid-tomentose like the calyx. *Calyx* with 5 deep linear teeth; the tube 10-ribbed, 1 to 1·25 in. long. *Corolla* 4 in. in diam., purple. *Fruit* pointed, hispid, as long as the persistent calyx. *Seeds* reniform, their edges densely fulvous-sericeous. Mast. in Hook. fil. Fl. Br. Ind. i. 337; Kurz For. Fl. Br. Burm. i. 126; DC. Prod. i. 455; Wall. Pl. As. Rar. i. 44, t. 51; Wall. Cat. 1903. *H. setosus*, Roxb. Fl. Ind. iii. 194. *H. vestitus*, Griff. Notul. iv. 519.

Penang, Perak. Distrib. Java, India.

4. *H. TILIACEUS*, Linn. Spec. 976. A small much branched tree; young branches minutely pubescent. *Leaves* sub-coriaceous, broadly cordate to reniform, minutely crenulate or entire, rarely lobed, acute; upper surface scaly, minutely pubescent, glabrescent or glabrous; lower densely and minutely hoary-pubescent; nerves 7 to 9 pairs, palmate; length and breadth 3·5 to 6·5 in., petioles 1·5 to 2 in., stipules oblong, oblique, shorter than the petiole. *Flowers* solitary; or in pedunculate, solitary, 2 to 3-flowered, axillary cymes; the peduncles 2 or 3 times as long as the petioles, with 2 obliquely oblong, opposite, pubescent, caducous bracts. *Involucres* 7 to 10, acute, united above the middle. *Sepals* 5, like the involucres but twice as long, with an elongated gland externally. *Corolla* campanulate, 4 in. in diam., yellow with crimson centre. *Fruit* as long as the calyx or shorter, ovate-acute, stellate-pubescent, spuriously 10-celled. *Seeds* few, obovate-reniform, faintly striate, sparsely scaly, pubescent, or glabrous. Mast. in Hook. fil. Fl. Br. Ind. i. 343; Kurz For. Fl. Burm. i. 126; DC. Prod. i. 454; Cav. Diss. iii. p. 151, t. 55, f. 1; Bl. Bijdr. 72; Roxb. Fl. Ind. iii. 182; Miq. Fl. Ind. Bat. i. pt. 2, 153; Beddome Fl. Sylvat. Anal. Gen. t. 4. *Paritium tiliaceum*, A. Juss. in St. Hil. Fl. Bras. Med. i. p. 156; (excl. syn. *H. elatum*) W. & A. Prodr. i. 52; Wight Ic. t. 7; Wall. Cat. 1912; Thwaites Enum. 26; Dalz. & Gibs. Bomb. Fl. 17; Griff. Notul. iv. 523. *H. tortuosus*, Roxb. Fl. Br. Ind. iii. 192; Wall. Cat. 1912 G, 1913 B.

All the provinces; near water. Distrib. The tropics generally near the coasts.

5. *H. FLOCCOSUS*, Mast. in Hook. fil. Fl. Br. Ind. i. 343. A tree 30 to 40 feet high; young branches, petioles, peduncles and outer surfaces of involucres and calyx rugulose and minutely rusty-puberulous. *Leaves* sub-coriaceous, cordate-reniform, 5-angled, acute, irregularly and

distantly sub-crenate; both surfaces minutely and sparsely stellate-pubescent, glabrescent when old, harsh; length and breadth 2 to 6 in., petiole less than half as long as the blade. *Flowers* in stout few-flowered terminal racemes longer than the leaves; peduncles stout, very rugulose, ebracteate, .75 to 1.5 in. long. *Involucres* combined into a bluntly-lobed cup much shorter than the calyx. *Sepals* oblong-lanceolate, 1.5 in. long, coriaceous, united for half their length or more. *Petals* membranous, spatulate, 4 in. long, glabrous inside, boldly striate and hispid-pubescent externally. *Staminal-tube* stellate-pubescent. *Capsule* obovoid, truncate, shorter than the persistent closely adherent calyx, densely stellate-pubescent and very rugulose, 5-valved, dehiscing only at the apex. *Seeds* numerous, obovate, sub-compressed, with shortly pilose angles, the rest of the surface scaly.

Mount Ophir, Malacca; Maingay (Kew Distrib.) 216. Perak; King's Collector 7024.

I have not been able to detect stipules on any of the specimens I have seen. They are probably fugacious.

#### 5. THESPESIA, Corr.

Trees or shrubs. *Leaves* entire. *Inflorescence* axillary. *Bracteoles* 5-8, arising from the thickened end of the peduncle, deciduous. *Calyx* cup-shaped, truncate, minutely 5-toothed. *Corolla* convolute. *Staminal-tube* 5-toothed at the apex. *Ovary* 4-5-celled; style club-shaped, 5-furrowed, entire or 5-toothed; ovules few in each cell. *Capsule* loculicidal or scarcely dehiscent. *Seeds* tomentose; cotyledons conduplicate, black-dotted.—Natives of tropical Asia, Madagascar, and Australasia; species about 6.

T. POPULNEA, Corr. in Ann. Mus. ix. p. 290. A tree 20 to 30 feet high, young shoots scaly. *Leaves* on long petioles, sub-coriaceous, broadly cordate, acuminate, entire, glabrous above, sparsely scaly on lower surface; the base 5 to 7-nerved with a glandular pore between the nerves; length 4.5 to 6 in., breadth 3 to 4 in., petiole 2.5 in. *Flowers* 2 to 3 in. in diam., solitary, axillary, on peduncles shorter than the petioles; *petals* bright yellow with a brown spot at the base; bracteoles close to the calyx, lanceolate, often abortive. *Capsule* 1 to 1.5 in. in diam., depressed-spheroidal, scaly, becoming glabrescent; pericarp of 2 layers. *Seeds* 1 to 3 in each cell, reniform, minutely tomentose or mealy. *Mast.* in Hook. fil. Fl. Br. Ind. i. 345; Kurz For. Fl. Burm. i. 128; Miq. Fl. Ind. Bat. i. pt. 2, 150; Pierre Fl. For. Coch-Chine x. 173; Bl. Bijdr. 73; Cav. Diss. iii. 152, t. 56, f. 1; DC. Prodr. i. 456; W. & A. Prodr. i. 54; Wight Ic. t. 8; Thwaites Enum. 27; Beddome Fl. Sylvat. t. 68;



Dalz. & Gibs. Bomb. Fl. 18; Wall. Cat. 1888, 1, 2, & C to H. Miq. Fl. Ind. Bat. i. pt. 2, 150. *Hibiscus populneus*, L.; Roxb. Hort. Beng. 51; Flor. Ind. iii. 190. *H. populneoides*, Roxb. l.c. *Malvariscus populneus*, Gærtn. Fruct. ii. 253, t. 135. *Azanza acuminata*, Alefeld Bot. Zeit. 1861, 299.

In all the provinces, on the sea-shore. Distrib. Tropics generally.

## 6. BOMBAX, Linn.

Trees. *Leaves* digitate, deciduous. *Peduncles* axillary or subterminal, solitary or clustered, 1-flowered. *Flowers* appearing before the leaves. *Bracteoles* 0. *Calyx* coriaceous, cup-shaped, truncate or lobed. *Petals* obovate or oblong. *Stamens* in 5 bundles opposite the petals: filaments numerous; anthers reniform, 1-celled. *Ovary* 5-celled, multi-ovulate; style clavate, stigmas 5. *Capsule* loculicidally 5-valved, valves coriaceous, woolly within. *Seeds* silky, the testa thin, albumen small; cotyledons contortuplicate. About 10 species, all tropical and mostly American; 1 in Africa.

1. *B. INSIGNE*, Wall. Pl. As. Rar. i. 71, t. 79, 80; Cat. 1341. A tall tree; trunk without prickles; branchlets armed or not; all parts glabrous. *Leaves* 7-9-foliolate; leaflets sub-coriaceous, obovate or oblanceolate, shortly acuminate, attenuate at the base, glaucous beneath; length 5 to 8 in., breadth 2.5 to 3 in.; petiolules .5 to .75 in.: petioles longer than the leaflets. *Flowers* 5 or 6 in. long, solitary towards the end of the leafless branches; peduncles .75 in. long, stout, clavate. *Calyx* 1.5 in. long, thickly coriaceous, urceolate-globose, obscurely and irregularly lobed, ultimately 2-cleft, sub-glabrous outside, silky inside. *Petals* fleshy, oblong, obtuse, recurved, internally glabrous, externally shortly sericeous, red to orange or yellowish. *Stamens* many; filaments fleshy, united for .5 in. above the base into 4 or 5 bundles. *Capsule* oblong, 10 in. long by 1.5 in. thick, curved, glabrous. Mast. in Hook. fil. Fl. Br. Ind. i. 349; Kurz For. Fl. Burm. i. 130; Journ. As. Soc. Beng. 1873, ii. p. 61. *B. festivum*, Wall. Cat. 1841.

Andamans. Distrib. Burmah.

The earliest name of this is *B. festivum* (1828). But at p. 89 of his Catalogue, Wallich changed this to *B. insigne*, under which name he figured and described it. It comes very near to *B. malabaricum*, DC.; but Wallich says it is a much smaller tree, and Kurz says it has many more stamens, than the former. I include it as an Andaman plant solely on the authority of the late Mr. Kurz, but I have seen no specimen collected by him or by any other person in the Andamans. And I have a strong suspicion that what Kurz regarded

as *B. insigne* is really an undescribed species which Wallich issued as 1840-2 B of his Catalogue under the name *B. malabaricum*, var. *albiflora*. His No. 3 of the same name I have not seen. A tree with leaves exactly like Wallich's 1840-4 and with unarmed trunk and branches has recently been collected in the little Cocos Island by Dr. D. Prain for the Calcutta Herbarium.

2. *B. MALABARICUM*, DC. Prod. i. 479. A tree with the general characters of the last, but much larger; and with the trunk and branches prickly, the leaflets much narrower (lanceolate not obovate) and the flowers and fruit smaller. Mast. in Hook. fil. Fl. Br. Ind. i. 349; Kurz For. Fl. Burm. i. 136; Bl. Bijdr. 81; Wight Ill. t. 29; W. & A. Prodr. i. 61; Wall. Cat. 1840 (exclude No. 4 and possibly No. 2 B); Beddome Fl. Sylvat. t. 82. *Salmaalina malubarica*, Schott Meletem, 35; Thwaites Enum. 28; Dalz. & Gibs. Bomb. Fl. 22; Miq. Fl. Ind. Bat. i. pt. 2, 166. *Bombax heptaphylla*, Cav. Diss. v. p. 296; Roxb. Hort. Beng. 50; Cor. Pl. iii. t. 247; Fl. Ind. iii. 167. *B. Ceiba*, Burm. Fl. Ind. 145, excl. syn. *Gossampinus rubra*, Ham. in Trans. Linn. Soc. xv.

Andaman Islands; common.

## 7. *ERIODENDRON*, DC.

Trees. *Leaves* digitate, deciduous. *Flowers* appearing before the leaves, tufted at the ends of the branches, or axillary, large white or rose-coloured. *Bracteoles* 0. *Calyx* cup-shaped, truncate, or 3-5-fid. *Petals* oblong. *Staminal* bundles 5, opposite the petals, connate at the base, each bearing 2-3 sinuous or linear anthers. *Ovary* ovoid, 5-celled; style cylindrical, dilated, stigma obscurely 5-lobed. *Capsule* oblong, coriaceous or woody, 5-celled, 5-valved, valves densely silky within. *Seeds* globose or obovoid; testa crustaceous, smooth with silky hairs, albumen scanty; cotyledons contortuplicate.—About eight species—1 Asiatic and African, the others American.

1. *E. ANFRACTUOSUM*, DC. Prod. i. 479. A tall tree, the trunk prickly when young; branchlets stout, smooth, glaucous. *Leaflets* 8 or 9, lanceolate, acuminate, entire or serrulate towards the apex, the base acute; glaucous beneath; length 3 to 4 in., breadth .75 to 1 in., petiolule .25 in. broad; petioles usually longer than the leaflets. *Flowers* pedunculate, in fascicles of 3 to 8 below the apices of the branches; peduncles 1 to 2 in. long, minutely bracteate: involucre none. *Calyx* cup-shaped, with 5 rounded lobes, glabrous externally, sericeous internally. *Petals* oblanceolate, tomentose externally, glabrous within, 1 to 1.5 in. long, whitish. *Filaments* shorter than the petals. *Capsule* oblong, 3 to 5 in. long, smooth. *Seeds* numerous, sub-ovoid, black. Mast. in Hook. fil.

Fl. Br. Ind. i. 350; Bl. Bijdr. 81; W. & A. Prodr. i. 61; Wight Ic. t. 400; Griff. Not. iv. 533; Dalz. & Gibs. Bomb. Fl. 22; Miq. Fl. Ind. Bat. i. pt. 2, 166; Beddome Fl. Sylvat. Anal. Gen. t. 4. Wall. Cat. 1839. *Bombax pentandrum*, Linn. Sp. Pl. 989; Cav. Diss. v. 293, t. 151; Roxb. Fl. Ind. iii. 165. *B. orientale*, Spreng. Syst. iii. 124. *Ocoba pentandra*, Gært. Fruct. ii. 244, t. 133; Ham. in Trans. Linn. Soc. xv. 126. *Eriodendron orientale*, Steud. Nomencl. 587; Thwaites Enum. 28; Kurz For. Fl. Br. Burm. i. 131.

In all the provinces. Distrib. Malayan Archipelago, British India, West Indies. Often planted.

## 8. DURIO, Linn.

Trees, with entire coriaceous penni-nerved leaves, scaly beneath (except in *D. Oxleyanus*). *Flowers* in lateral cymes: peduncles angular. Bracts 2 or 1, connate into a cup, or distinct below, tips free, deciduous. *Calyx* bell-shaped, leathery, like the bracteoles densely scaly, the sepals distinct, or 5-fid, lobes valvate oblong or rounded. *Petals* 5, contorted-imbricate, spathulate, longer than the sepals. *Staminal-tube* divided into 4-5 phalanges opposite the petals; filaments many, bearing a globose head of sinuous 1-celled anthers, or (in *D. Oxleyanus*) a single annular 1-celled anther. *Ovary* usually scaly externally, 4-5-celled; styles connate, stigmas capitate; ovules many and 2-seriate in each cell. *Fruit* very large, subglobose or oblong, spiny, indehiscent or loculicidally 5-valved. *Seeds* arillate; cotyledons fleshy, often connate. Distrib. Malay Peninsula and islands; species 3.

1. *D. ZIBETHINUS*, Linn. Syst. Nat. edit. xiii. p. 581. A tall tree; young branches thin and, like all the soft parts except the upper surfaces of the leaves, minutely scaly. *Leaves* elliptic-oblong, rarely obovate-oblong, shortly and abruptly acuminate, the base rounded; both surfaces shining, the upper glabrous, the lower adpressed-lepidote; main nerves 10 to 12 pairs, thin, slightly ascending; length 4·5 to 6 in., breadth 1·5 to 1·8 in., petiole 4 to 5 in. *Flowers* 2 in. long, 2 to 3 in. in diam., on long slender pendulous dichotomous peduncles in fascicles from the stem and larger branches, globose in bud: peduncles lepidote, 3 in. long, the bracts embracing the calyx and shorter than it. *Calyx* tubular, ventricose at the base, the limb with 5 or 6 short broad teeth. *Petals* twice as long as the calyx, spathulate. *Stamens* in 5 bundles united only at the very base; the filaments in each bundle united for one-fourth of their length: anthers glomerulate, reniform, compressed. *Ovary* elongate-ovoid, scaly; style pubescent, as long as the stamens. *Fruit* ovoid-globose, 8 to 12 in. long, woody, densely covered with strong

smooth pyramidal spines, 5-valved. *Seeds* few, large, with copious succulent arillus. *Mast.* in Hook. fl. Fl. Br. Ind. i. 351, and Journ. Linn. Soc. xiv. 501; Beccari Malesia, iii. 230, t. xii. f. 1 to 5, xxxvi. f. 1 to 12; Kurz For. Fl. Burm. i. 131; DC. Prod. i. 480; Bl. Bijdr. 81; Koen. in Trans. Linn. Soc. vii. 266, t. 14—16; Roxb. Fl. Ind. iii. 399. Miq. Fl. Ind. Bat. i. pt. 2, 167. Griff. Not. iv. 528; Ic. t. 596. Wall. Cat. 1842. —Rumph. Amb. i. 99, t. 29.

In all the provinces except probably the Nicobars, cultivated. *Distrib.* Malayan Archipelago.

2. *D. LOWIANUS*, Scortechini MSS. A tree 50 to 60 feet high; young branchlets and petioles and lower surface of midrib with rather large loose scales. *Leaves* narrowly elliptic-oblong, shortly acuminate; the base rounded, not attenuate; upper surface glabrous, the midrib puberulous, lower quite covered with adpressed scales, mostly minute, but a few larger and loose; main nerves 14 to 18 pairs, faint, sub-horizontal; length 4·5 to 5·5 in., breadth 1·5 to 2 in.; petiole ·5 in. stout. *Cymes* crowded on small tubercles on branches several years old, trichotomous, 3 in. in diam. and about as long. *Flower-pedicels* ·5 to ·75 in. long, angled, covered with loose coppery scales. *Flowers* 2 in. in diam.; bracts 2 or 3, ·5 in. long, broadly ovate, connate, deciduous. *Calyx* campanulate, its base sub-inflated, ·75 in. long, its mouth with 3 broad blunt, shallow teeth, glabrous inside, covered with large silvery scales outside. *Petals* 5, oblanceolate, glabrous inside, pubescent outside, 1·25 in. long. *Stumens* in 5 phalanges, dividing shortly above the base into about 8 processes each dividing at its apex into several short filaments, each bearing a single reniform anther with marginal dehiscence. *Ovary* broadly ovoid, densely covered with large loose scales, 5-celled with 4 ovules in each, biseriate. *Style* cylindric, tapering, pubescent: stigma capitate. Fruit unknown.

Perak. Scortechini No. 1969.

A species collected only once and named by the late lamented Father Scortechini in honour of Sir Hugh Low, representative of the British Government at Perak, and to whose enlightened help Malayan Botany owes very much. The species approaches *D. Zibethinus* in many respects.

3. *D. MALACCENSIS*, Planch. MSS. *Mast.* in Hook. fl. Fl. Br. Ind. i. 351. A tree; the young branches thin, very minutely adpressed-scaly. *Leaves* elliptic-lanceolate with acute apices; the base acute, sometimes slightly rounded; main nerves about 20 pairs, thin, almost horizontal; both surfaces shining, the upper glabrous, the lower very

minutely adpressed-scaly; length 5 to 6·5 in., breadth 1·5 to 1·8 in.; petiole ½ in., scaly like the branches. *Peduncles* ½ to 1 in. long, in fascicles from tubercles on the stem, angled, bifurcating at the apex and bearing two pedicellate flowers, sometimes bearing one or two pedicels below the apex: pedicels two or three times as long as the common peduncles, angled, loosely scaly. *Flowers* 2·5 to 3 in. long. *Bracts* 2, broadly ovate, acute, embracing the buds. *Sepals* 5, ovate-oblong, blunt, valvate, 1·25 in. long, glabrous internally but with numerous very loose scales externally. *Petals* nearly twice as long as the sepals, narrowly oblong, pubescent on both surfaces, the outer with a few loose scales. *Anthers* narrowly oblong, 1-celled, sessile in groups on the apices of groups of combined filaments which are again united into 5 phalanges which, for more than half their length, form a tube round the ovary and style. *Ovary* oblong, angled, densely covered with scales with long cylindric stalks and flat heads. *Style* shorter than the staminal tube, pubescent, slightly scaly. *Stigma* capitate. *Young fruit* globular, densely covered with subulate pubescent spines. *Ripe fruit* unknown. *Mast.* in Journ. Linn. Soc. xiv. p. 501, t. xiv. fig. 17 to 20: *Beccari Malesia*, iii. 237, t. xii. fig. 6 to 8.

Malacca; Griffith, Maingay (No. 212, Kew Distrib.) Distrib. Burmah.

This is known only from Malacca and Burmah. It is distinguished from *D. Perakensis*, which in other respects it much resembles, by the stalked scales on the ovary, and by the larger and looser scales on the leaves. Doubtless when ripe fruit of both is found, better characters will be yielded by it. Beccari's specimen No. 852, and the same distinguished botanist's Nos. 2190 and 2590 from Borneo, have been referred by Masters (Journ. Linn. Soc. l. c.) to this species. But Beccari (in *Malesia* iii. 238, 244) founded his species *D. affinis* on the former, and his *D. testitudinarum* on the two latter.

4. *D. TESTITUDINARUM*, Becc. *Malesia*, iii. p. 244, t. xiii and xiv. A tall tree bearing flowers only near the base of the trunk; young branches rather slender, minutely sub-adpressed scaly. *Leaves* narrowly elliptic-oblong or oblanceolate-oblong, acute or shortly acuminate, the margins (in var. 2) sometimes with a single wide shallow indentation, the base rounded; upper surface glabrous, the lower densely covered with sub-adpressed scales: main nerves 18 to 22 pairs, rather bold, subhorizontal: length 4·6 to 8·5 in. (only 2·5 to 3·5 in. in var. 1 and much longer and broader in var. 2); breadth 1·4 to 2·2 in.; petiole 6 to 25 in., thickened at apex. *Flowers* 3 to 3·5 in. long, in short condensed bracteolate racemes from tubercles near the base of the trunk;

the axes, pedicels, bracteoles and bracts densely covered with large loose scales: bracts enveloping the buds 2, broadly ovate, blunt. *Sepals* 5, valvate, wide and saccate at the base, the apices narrowed, glabrous inside, densely covered outside with loose large scales. *Petals* narrowly oblong, obtuse, more than twice as long as the sepals. *Stamens* as in *D. Malaccensis*. *Ovary* oblong, densely covered with loose, flat, sessile scales. *Style* shorter than the stamens, pubescent, sparsely scaly. *Stigma* capitate. *Fruit* (according to Beccari) on long peduncles, globose, 4 in. in diam., with 4 or 5 slight superficial grooves, densely covered with short broad pyramidal spines. *Seeds* sub-ovate, obtuse, angled; the arillus short, thin, cup-shaped.

Perak; at low elevations, Kunstler, Wray. Distrib. Borneo.

Var. 1. *Pinangiana*, Becc. l. c. 246. Leaves narrowly lanceolate, acuminate, 2·5 to 3·5 in. long by ·6 to ·9 in. broad. *Flowers* smaller than in the typical form: fruit unknown.

Penang, at 2,500 feet; Curtis No. 293. This variety, of which only imperfect specimens have as yet been obtained, will probably, when full material shall be forthcoming, prove to be a distinct species.

Var. 2. *macrophylla*, King. Leaves 10 to 17 in. long, 2·5 to 5·5 in. broad, the edge sometimes with a single shallow indentation. Racemes 3 in. long, many-flowered, with numerous bracteoles.

Perak; Kunstler 7497, Wray 3397. No fruit of this variety has as yet been collected. Like the last, it may prove to be a distinct species.

5. *D. WRAYII*, King, n. sp. A large tree; young branches very slender and, like the petioles and under surface of midrib, covered with rather large adpressed pale brown scales. Leaves narrowly elliptic-oblong with caudate acuminate apex and rounded base; upper surface quite glabrous, lower closely covered with thin adpressed silvery scales smaller than these on the midrib; main nerves 10 to 12 pairs, sub-horizontal, faint: length 5·5 to 8·5 in., breadth 2 to 2·5 in., petiole ·75 in. *Flowers* nearly 2 in. long, from the branches; pedicels of individual flowers rather more than 1 in. long, with many large loose scales. *Bracts* 3, broadly ovate, connate. *Calyx* cup-shaped, the mouth with 5 broad, rather deep, sub-acute teeth; inside glabrous, outside covered with large adpressed silvery scales as are also the bracts. *Petals* 1·5 in. long, oblanceolate, or spatulate-clawed, the claw very narrow, pubescent on both surfaces but especially on the outer. *Stamens* in 5 phalanges united at the bases only, each phalange dividing into 5 or 6 processes at the apices of which are born about 8 narrow reniform anthers dehiscing by their edges. *Ovary* broadly ovoid, loosely scaly.

*Style* longer than the stamens, cylindric, pubescent, not scaly: stigma capitate. *Fruit* unknown.

Upper Perak at 300 feet; Wray.

The fruit of this is unknown. Mr. Wray describes the petals as pink. The caudate-lanceolate leaves of this are different from those of any other *Durio* of the Malayan Peninsula.

6. *D. OXLEYANUS*, Griff. Notul. iv. 531. A tree, the young branches, petioles and under surfaces of the midrib adpressed-lepidote. *Leaves* elliptic-oblong, rounded at base and apex; upper surface glabrous; the lower softly pubescent, not scaly except on the midrib, the 15 to 18 pairs of main nerves stout, sub-horizontal, prominent beneath; length 3·5 to 5 in., breadth 1·5 to 2 in., petiole ·5 in. *Flowers* about 1 in. in diam., in few-flowered scaly cymes from the smaller branches. *Involucral bracts* 2, broadly ovate, pubescent, sparsely and minutely scaly. *Calyx* cup-shaped, the mouth with 4 broad shallow rather blunt teeth, inside glabrous, outside with many large loose scales. *Petals* 4, oblanceolate or spatulate, little longer than the calyx, pubescent on both surfaces, not scaly. *Stamens* 20, shorter than the petals; 5 free and alternating with 5 phalanges of 3 each which are slightly united by the bases of their filaments: *anthers* solitary, drum-shaped, the dehiscence circular. *Ovary* depressed-globular, 4-celled, densely stellate-hairy. *Style* cylindric, pilose; stigma capitate. *Fruit* unknown. Mast. in Hook. fil. Fl. Br. Ind. i. 351 and Journ. Linn. Soc. xiv. 501, t. xvi. fig. 13 to 16. Beccari Malesia, III, 252. *Neesia Griffithii*, Planch. MSS.

Malacca, Griffith No. 545. Maingay, No. 220, (Kew Distrib.)

This differs, as Beccari has well pointed out (Malesia l. c.), from the other species of *Durio* by the absence of scales from every part of the leaf except the petiole and midrib; by the single, not glomerulate, anthers; by the hairy, not squamose, ovary. Should the fruit when found also present differences, it may be desirable to create a new genus for this species.

#### 9. *BOSCHIA*, Korth.

Trees. *Leaves* oblong, entire, scaly beneath. *Flowers* small, axillary. *Bracteoles* 2-3, connate at the base, deciduous. *Calyx* deeply 4-5 parted. *Petals* linear-ligulate, entire or laciniate. *Stamens* many, some free, others irregularly coherent, outermost without anthers; anthers globose, 1-celled, opening by a terminal pore, solitary, or in groups of 2-6. *Ovary* 3-5-celled, style elongate; ovules one or more in each cell. *Fruit* oblong, 3 to 5-celled, 3 to 5-valved, muricate. *Seeds* few, ovoid, half-covered by a fleshy, coloured, cup-shaped arillus; cotyledons foliaceous. Species 4: all Malayan.

1. *B. GRIFFITHII*, Masters in Hook. fil. Fl. Br. Ind. i. 352. A tree 40 to 60 feet high; young branches rather slender, pale, minutely furfuraceous. *Leaves* oblong, or elliptic-oblong, or obovate-oblong, shortly and abruptly acuminate, slightly narrowed towards the rounded base; upper surface quite glabrous; the lower pale, very minutely pubescent, the midrib and nerves slightly scaly; main nerves 8 to 11 pairs, spreading, prominent beneath and dark coloured; length 5 to 6·5 in., breadth 1·5 to 2·25 in., petiole ·4 to ·6 in.: stipules linear, deciduous. *Flowers* ·75 in. in diam., solitary, or in 2 to 3-flowered cymes from the axils of leaves or of fallen leaves; pedicels shorter than the petioles, bracteolate. *Involucral bracts* 2, broadly-ovate, blunt, connate at the base, closely enveloping the buds; scaly externally, glabrous within. *Sepals* 4, ovate, spreading, pubescent on both surfaces, scaly also on the outer. *Petals* 4 to 8, nearly twice as long as sepals, linear or linear-spathulate, ·1 in. broad. *Stamens* very numerous, unequal, slightly united by the bases of the filaments: the outer without anthers, some flat resembling the petals, a few of the inner longer and bearing at their apices 1 to 4 oblong obovoid anthers which dehisce by an apical pore. *Ovary* ovoid, 3-celled, densely covered with peltate, fimbriate, long-stalked scales. *Style* as long as the longest stamens. *Stigma* subcapitate. *Fruit* oblong, pointed at each end, 1·5 to 2 in. long, densely covered with sharp stout conical spines, 3-celled, dehiscent. *Seeds* 3 to 6, or fewer. *Mast.* in Journ. Linn. Soc. xiv. t. xv, fig. 29 to 39, t. xvi., fig. 40 to 42. *Beccari Malesia* III, p. 256. *Heteropyxis*, Griff. Not. iv. 524; Ic. Pl. As. t. 594.

Malacca; Griffith, Maingay. Perak, very common. *Distrib.* Sumatra, Forbes, No. 3068.

#### 10. *NEESIA*, Blume.

Trees. *Branches* marked with large leaf-scars. *Leaves* entire, pinnate-veined. *Stipules* leafy. *Cymes* from the stem in the axils of the fallen leaves. *Bracteoles* 3, connate into a cup, deciduous, covered, like the sepals, with peltate scales. *Calyx* ventricose, conical above, opening by a circular irregularly crenulate orifice at the top, ultimately dilated and cushion-shaped at the base. *Petals* 5, free, imbricate. *Stamens* numerous, the filaments more or less united; anthers 2-celled, opening lengthwise, connective thick; staminodes 0. *Ovary* oblong, 5-celled; style short; stigma capitate; ovules numerous, 2-seriate, horizontal, anatropous. *Fruit* ovoid, woody, muricate, loculicidally 5-valved. *Seeds* albuminous; aril 0; cotyledons flat, leafy. *Distrib.* Seven species, all Malayan.



*N. SYNANDRA*, Mast. in Hook. fl. Fl. Br. Ind. i. 352. A tree 70 to 100 feet high; young branches stout, their bark dark lenticellate and with large cicatrices. *Leaves* large, crowded near the apices of the branches, coriaceous, oblong-elliptic to obovate-elliptic: the apex rounded, emarginate; the edges sub-undulate, slightly narrowed in the lower third to the sub-cordate base; upper surface glabrous, lower puberulous; nerves 13 to 22 pairs, spreading, stout and distinct on both surfaces, the reticulations also distinct; length 7 to 16 in., breadth 3·5 to 8 in.; petiole 1·5 to 3 in., thickened at base and apex; stipules foliaceous, with very stout midribs, 1·5 to 2·5 in. long. *Cymes* short (1·5 in. long), crowded, dichotomous, 8 to 12-flowered, from the axils of sub-apical fallen leaves; the pedicels short, scaly. *Flowers* about 6 in. long. *Bracts* connate into a 3-lobed cup surrounding the base of the flowers. *Calyx* ventricose with a contracted irregularly and minutely toothed mouth, densely pubescent inside, scaly outside as are the bracts, ultimately involute so as to form an annular cushion 5 in. or more in diam. *Petals* 5, free, much imbricate, ovate-lanceolate, glabrous. *Stamens* numerous, the filaments more or less connate at the base, unequal; anthers sub-globular, 2-celled. *Ovary* conical, sessile, densely pilose, not scaly: style slightly longer than the ovary; stigma capitate, 5-angled. *Fruit* 6 to 8 in. long and 4 to 5 in. in diam., ovoid-conic, pedunculate, with 5 bold rounded vertical angles: the pericarp very thick, woody, externally covered with stout pyramidal sharp spines, internally lined with a dense layer of stiff yellow hair; 5-celled, dehiscent. Mast. in Journ. Linn. Soc. xiv. p. 504. *Beccari Malesia*, iii. 263.

Malacca, Maingay. Perak; Scortechini, Wray, King's Collector.

I have seen no specimens of the plant (*N. altissima*) on which Blume founded this genus. But, judging from his admirable description and fine coloured figure (Nov. Act. Acad. Caes. xvii. 83, t. vi), this species must be very closely allied to that. I find the stamens of this agree both with Blume's description above referred to, and with Sig. Beccari's, in his admirable and splendidly illustrated monograph in *Malesia* iii. pp. 258 to 268. Ripe fruit and seeds of this are as yet unknown.

## 11. CÆLOSTEGIA, Benth.

Tall trees. *Leaves* simple, entire, scaly beneath. *Flowers* small (scarcely 25 in. in diam.), cymose; the inflorescence, bracts and calyx scaly. *Bracts* connate into a toothed cup. *Calyx* with constricted tube, pouched above and constricted at the apex into 5 connivent lobes. *Petals* 5, free, inserted near the apex of the calyx tube, connivent. *Stamens* numerous; the filaments short, thick, slightly connate at the base, the apex constricted; the anthers globose, 3 to 4-celled. *Ovary*

partly immersed in the calyx-tube, globular or sub-globular, 5-celled; the ovules few, erect. *Style* short; stigma peltate, discoid, large. *Fruit* large, woody, muricate externally, hairy within, 5-celled, few-seeded, dehiscent. Three species; all Malayan.

C. GRIFFITHII, Benth. in Benth. & Hook. fl. Gen. Plant. i. 213. A tree; the young branches rather slender, dark-coloured, striate, minutely and deciduously scaly. *Leaves* coriaceous, oval, shortly and bluntly acuminate, the base rounded; upper surface glabrous, lower sparsely adpressed-scaly; main nerves about 8 pairs, spreading, faint; length 2·4 to 3·75 in., breadth 1·25 to 1·6 in.; petiole ·5 to ·75 in., minutely adpressed-scaly. *Inflorescence* of fasciculate cymose racemes about 2 in. long, from the axils of fallen leaves, many-flowered; pedicels longer than the flowers. *Flowers* ·25 in. in diam., scaly. *Bracts* connate into a 3-lobed cup less than half as long as the calyx. *Calyx* constricted at the base, then dilated into a 5-pouched sac which is contracted and 5-toothed at its apex. *Petals* 5, distinct, inserted on the calyx at the apex of its tube, triangular, acute, connivent, fleshy, glabrous. *Stamens* numerous, attached to the petals; the anthers small, globose, 3 or 4-celled. *Ovary* globular-obovate, densely covered with large loose scales. *Style* shorter than the ovary; stigma peltate, thick, its edges wavy. *Fruit* unknown. Mast. in Hook. fl. Fl. Br. Ind. i. 353 and Journ. Linn. Soc. xiv. 505, t. xvi, figs. 43 to 50. *Beccari Malesia*, iii. 270.

Malacca, Griffith; Perak, Scortechini, King's Collector.

*Fruit* was not known when this genus was first established by the late Mr. Benthams; and, of this species, fruit is still unknown. Sig. Beccari has, however, discovered two species in Sumatra and Borneo (*C. Sumatrana* and *Bornensis*) the fruit of which he describes and figures (*Malesia*, iii. 271, t. xxvii. to xxix); and from his description the generic description has been completed.

#### Order XVIII. STERCULIACEÆ.

Herbs, shrubs or trees; herbaceous portions usually more or less stellate-pubescent. *Bark* usually abounding in mucilage, inner fibrous. *Leaves* alternate, simple, often lobed, stipulate. *Inflorescence* axillary, rarely terminal, usually cymose. *Flowers* regular, uni- or bi-sexual. *Sepals* 5, often connate. *Petals* 5 or 0. *Andræcium* columnar or tubular, of many stamens; or stamens rarely few, free; anthers in heads, or in a single ring at the apex of the column, or dispersed on the outside of the tube, or arranged along the edge of a cup or tube, with intervening staminodes or sterile stamens; anther-cells always 2,

parallel or divergent. *Ovaries* 2 to 5, free, rarely 1, sessile or stalked; styles slightly united and becoming free or slightly coherent, as many as the ovaries. *Ovules* many or few, attached to the inner angles of the ovaries, anatropous, ascending or horizontal, raphe ventral or lateral. *Fruit* dry or fleshy, dehiscent or indehiscent. *Seeds* sometimes arillate, albuminous or exalbuminous: cotyledons leafy, flat, folded or convolute; radicle short, inferior, pointing towards, or remote from the hilum. Distrib. Abundant in the tropics of either hemisphere and in subtropical Africa and Australia. Genera 40—45; species from 500 to 600.

Tribe I. *Sterculiæ*. *Flowers* unisexual or polygamous. *Petals* 0. *Andræcium* columnar; the anthers clustered at its apex; or in a 1-seriate ring.

Anthers numerous.

Ovary with 2 or more ovules in each cell; fruit dehiscent ... 1. *Sterculia*.

Ovarian cells 1-ovuled; fruit indehiscent 2. *Tarrietia*.

Anthers 5, whorled; fruit indehiscent.

3. *Heritiera*.

Tribe II. *Helicteræ*. *Flowers* hermaphrodite. *Petals* deciduous. *Andræcium* columnar below, dilated above into a cup, margin bearing on it the anthers usually alternating with staminodes.

Capsule membranous, inflated... 4. *Kleinhovia*.

Capsule more or less woody, not inflated.

Anther-cells divaricate; seeds not winged 5. *Helicteres*.

Anther-cells parallel; seeds winged ... 6. *Pterospermum*.

Tribe III. *Hermannieæ*. *Flowers* hermaphrodite. *Petals* marcescent, flat. *Andræcium* tubular at the base only; stamens 5, staminodes 0.

Ovary 5-celled ... 7. *Melochia*.

Ovary 1-celled, 1-seeded ... 8. *Waltheria*.

Tribe IV. *Buettneriæ*. *Petals* concave or unguiculate at the base; filaments in a tube with the anthers at its apex, solitary or in groups between staminodes.

Stamens in a single series.

Stamens in groups between the staminodes;

Petals unguiculate ... 9. *Abroma*.

Stamens solitary between the staminodes.

- Petals unguiculate, with 2 lateral lobes and a long subterminal appendage ... 10. *Buettneria*.  
 Petals linear not lobed, concave not unguiculate at the base ... 11. *Commersonia*.

Stamens in several series ... 12. *Leptonychia*.

# 1. STERCULIA, Linn.

Trees or shrubs. *Leaves* simple, entire or palmately lobed, sometimes digitately compound. *Inflorescence* paniced or racemose, usually axillary and crowded towards the apices of the branches. *Flowers* male and hermaphrodite. *Calyx* campanulate or rotate, 4-5 lobed, often coloured. *Petals* 0. *Staminal column* bearing a head or ring of usually sessile, 2-celled, anthers at its apex, the cells often divergent. *Carpels* 5, distinct or slightly cohering, 2 to many-ovuled, borne on the apex of a more or less elongated gynophore; styles more or less connate: stigmas free or united so as to form a peltate lobed disc. *Ripe carpels* distinct, spreading, sessile or stalked, follicular, from membranous to woody, with several (rarely many) seeds; or navicular with a single seed. *Seeds* 1 to many, sometimes winged, rarely arillate; albumen bipartite, flat or lobed: cotyledons thin flat and adherent to the albumen, or fleshy; radicle near to or remote from the hilum. *Distrib.* About 70 species tropical and chiefly Asiatic.

Sect. I. *Eusterculia*, Endl. *Follicle* coriaceous or woody. *Seeds* two or more.

*Leaves* simple, orbicular or reniform.

*Leaves* lobed.

Follicles glabrous within, the edges only ciliate; gynophore and staminal tube glabrous ... 1. *S. villosa*.

Follicles hispid-pilose within; gynophore and staminal tube hairy ... 2. *S. ornata*.

*Leaves* not lobed ... 3. *S. macrophylla*.

*Leaves* simple, longer than broad; not orbicular or reniform.

*Leaves* quite glabrous.

*Calyx-lobes* not cohering by their apices ... 4. *S. laevis*.

*Calyx-lobes* cohering by their apices.

*Flowers* in racemes: nerves of leaves 6 pairs or fewer ... 5. *S. hyposticta*.

- Flowers in panicles: nerves of  
leaves more than 6 pairs  
Leaves narrowly oblong-lanceo-  
late; follicles 1 to 1.25 in.  
long ... .. 6. *S. parvifolia*.  
Leaves ovate or obovate-oblong  
to narrowly elliptic.  
Ovaries 3, villous; stamens 7 7. *S. Kunstleri*.  
Ovaries 5, scaly; stamens 10 8. *S. parvifolia*.  
Leaves more or less hairy.  
Calyx-lobes not cohering by their  
apices: leaves glandular-dotted  
beneath ... .. 9. *S. Scortechinii*.  
Calyx-lobes slightly cohering by their  
apices: leaves white beneath ... 10. *S. bicolor*.  
Calyx-lobes spreading, connivent and  
cohering by their apices.  
Stigmas free, long, recurved .. 11. *S. angustifolia*.  
Stigmas united into a lobed disc.  
Leaves more or less obovate 12. *S. rubiginosa*.  
„ lanceolate ... .. 13. *S. ensifolia*.  
Species of uncertain position... .. 14. *S. pubescens*.
- Sect. II. *Firmiana*, Marsili; Br. in Benn. Pl. Jav.  
Rar. 235 (gen.). *Follicles* membranous,  
opening long before maturity. *Seeds* two or  
more.  
Calyx .75 in. long: staminal tube about  
the same length; adult leaves glabrous... 15. *S. colorata*.  
Calyx 1.25 in. long, staminal tube .5 in.  
longer: adult leaves minutely stellate-  
pubescent ... .. 16. *S. fulgens*.
- Sect. III. *Pterygota*, Endl. (gen.). *Follicles* woody.  
*Seeds* many, winged at the apex ... 17. *S. alata*.
- Sect. IV. *Scaphium*, Endl. *Anthers* 15, (some-  
times 10). *Stigmas* lobed. *Follicles* large,  
membranous, boat-shaped, often gibbous,  
opening long before maturity, containing  
only 1 seed near the base.  
Leaves ovate-rotund, deeply cordate ... 18. *S. linearicarpa*.  
Leaves ovate to ovate-oblong: main  
nerves 2 to 4 pairs ... .. 19. *S. scaphigera*.

Leaves elliptic-oblong: main nerves 6 to ..

7 pairs ... .. 20. *S. affinis*,

Sect. V. *Pterocymbium*, Br. in Benn. Pl. Jav. Bar.

219 (gen.). Flowers sub-hermaphrodite.

Anthers 10. Styles coherent, stigmas recurved. Follicles 4—6, membranous, opening long before maturity. Seed solitary.

Leaves broadly ovate, acuminate, the

base deeply cordate ... .. 21. *S. campanulata*.

Leaves elliptic-oblong; the base broadly

rounded or sub-truncate, not cordate... 22. *S. tubulata*.

1. *S. VILLOSA*, Roxb. Hort. Beng. 50. A tree 30 to 60 feet high: young branches thick, their apices tawny-tomentose and enveloped by the large sub-caducous stipules, the bark pale with large leaf-cicatrices. Leaves thickly membranous, rotund or reniform, with 5 to 7 broad abruptly acuminate often toothed lobes, the sinuses between the lobes acute; the base deeply cordate, the basal lobes rounded: upper surface at first minutely stellate-pubescent, ultimately glabrous, except the 5 to 7 radiating tomentose nerves: under surface uniformly and minutely tomentose; length and breadth from 12 to 18 inches: petiole deciduously densely pubescent, about as long as the blade: stipules ovate-lanceolate, acuminate, with cordate bases, pubescent, sub-caducous. Panicles from the axils of the previous year's leaves, solitary, from 6 to 12 in. long: branches short, many-flowered, tomentose. Calyx campanulate, '4 in. in diam., with 5 ovate acute spreading lobes as long as the tube, yellowish with purple fundus, veined, puberulous outside especially towards the base, almost glabrous inside. Male flower; staminal column longer than the calyx-tube, slightly curved, quite glabrous, bearing at its apex 10 sub-sessile anthers with thick connective and 2 divergent cells. Female flower; gynophore glabrous, thickened above; ovaries 5, conjoined, tomentose; styles conjoined, puberulous, curved; stigma small, lobed. Follicles 3 to 5, coriaceous, sessile, bright red when ripe, oblong, tapering to both ends; 2 to 2.5 in. long by 1 in. broad; shortly hispid-pubescent externally, smooth and shining internally and glabrous except along the placental edges which are strongly oiliate. Seeds 6 or more, oval, smooth. Roxb. Fl. Ind. i. 153; Kurz For. Fl. Burm. i. 136; Mast. in Hook. fil. Fl. Br. Ind. i. 355; Pierre Fl. Forest. Coch-Chine, t. 185, fig. D.; Wall. Cat. 1136, 2, 3, D.; W. & A. Prodr. i. 63; Dalz. & Gibs. Bomb. Fl. 22; Br. in Benn. Pl. Jav. Bar. 227.

Andamans, Prain. Distrib. British India.

2. *S. ORNATA*, Wall. in Herb. Calcutta. A tree 20 to 30 feet high : young branches thick, glabrous, pale, the leaf-cicatrices very large, the apices deciduously pilose, coccineous drying into brown. *Leaves* thickly membranous, reniform, more or less deeply divided into 5 or 7 acuminate lobes, the sinuses between the lobes wide, the base deeply cordate ; upper surface minutely strigose, often stellate, minutely pitted ; lower surface yellowish-brown, minutely and uniformly tawny-tomentose, minutely glandular-dotted under the hair ; the 5 to 7 radiating main nerves and the ascending secondary nerves bold and distinct ; length about 12 in., breadth about 15 in. ; petiole 15 to 18 in. long, thickened at the base, minutely tomentose. *Panicles* from the axils of the previous year's leaves, solitary, 8 to 15 in. long, shortly branched, many-flowered, pulverulent reddish-tomentose. *Calyx* ochre-coloured with red fundus, veined, widely campanulate, sub-rotate, with 5 ovate acute spreading lobes longer than the tube, stellate-pubescent externally, puberulous internally ; .75. in. in diam. *Male flower* ; gynophore about as long as the tube, curved, sparsely glandular-hairy, bearing at its apex 10 small anthers with thick connective. *Female flower* ; gynophore thickened above, densely tawny-tomentose as are the conjoined ovaries and curved style ; the ovaries with a ring of about 10 sessile anthers at their base ; stigma discoid, rugulose, 5-lobed. *Follicles* about 5, sessile, coriaceous, narrowly oblong, very shortly beaked, brilliant orange scarlet when ripe, outside glabrescent, inside densely coccineous-pilose ; length 4 in., breadth 1.25 in. *Seeds* about 6, oval, smooth. Wall. in Voigt Hort. Calc. Suburb. 105 (*name only*) ; Kurz Journ. As. Soc. Beng. Vol. xlii. pt. 2, p. 258 ; Vol. xliii. pt. 2, p. 116 ; For. Fl. Burm. i, 136. *Sterculia armata*, Mast. in Hook. fil. Fl. Br. Ind. i. 357, *in part*. Pierre Fl. Forest. Coch-Chine, t. 185, fig. C.

Burmah ; Wallich, Brandis, Kurz. Andaman, Kurz.

I include this species because, although the evidence of its having been collected in the Andamans is not very good, I think it extremely likely that it does occur there, and that good unmistakeable specimens will soon be forthcoming. The species in many respects resembles *S. villosa*, with which it appears to have often been confused. The distinctive marks to separate it from *S. villosa* are that the leaves are minutely dotted and pitted ; that the apices of the young branches have red hairs (becoming brown on drying) ; that after the hairs have fallen the young branches have pale polished bark with very large leaf-cicatrices and some warts, but no sub-persistent stipules ; that the flowers are larger (.75 in. in diam. as against .4 in.) ; that the staminal column and gynophore are hairy ; that the follicles are larger and paler ; and that the whole of their inner surface is densely hispid-pilose.

3. *S. MACROPHYLLA*, Vent. Hort. Malm. ii. No. 91 (in note). A tree 80 to 120 feet high; young branches very thick, rough from the leaf cicatrices, the apices deciduously rufous or tawny-pilose. *Leaves* subcoriaceous, broadly ovate to ovate-rotund or obovate-rotund, entire, narrowing to the slightly cordate 7-nerved base; upper surface sparsely and rather minutely pubescent, some of the hairs 2-branched, becoming glabrescent with age, the midrib and nerves always pubescent; under surface sub-tomentose, tawny, the midrib and 6 to 8 pairs of lateral nerves prominent, rufous-villose; transverse venation distinct, rather straight; length 8 to 16 in., breadth 6 to 12 in., petiole 3·6 to 6 in., softly hairy, tawny. *Panicles* solitary, axillary, nearly as long as the leaves, much-branched, many-flowered, hispidulous-pubescent, capillary, shorter than the flowers. *Flower-buds* minute, sub-globose. *Ocalyx* 1·5 in. long, campanulate, stellate-hairy, 5-lobed; the lobes triangular, erect, shorter than the tube. *Follicles* 3 to 5, shortly stalked, woody, sub-rotund, about 2·25 in. each way, crimson when ripe, outside pubescent and longitudinally rugose; inside smooth. *Seeds* oblong, black, smooth, 7·5 in. long. Mast. in Hook. fil. Fl. Brit. Ind. i. 356; R. Brown in Benn. Pl. Jav. Rar. 230.

Malacca; Maingay No. 233 (Kew Dist.). Perak; at elevations of 200 to 500 feet; King's Collector Nos. 6052 and 7923; Scortechini, No. 230. Distrib. Java, Brit. North Borneo.

4. *S. LAEVIS*, Wall. Cat. 1138. A shrub or small tree; young branches rather thin, with pale striate bark, the apices deciduously rusty-puberulous. *Leaves* membranous, narrowly ovate-oblong, sometimes slightly obovate, the apex shortly and bluntly acuminate; the base tapering, acute, rarely rounded, faintly 3-nerved: both surfaces glabrous, shining, the midrib and 6 to 9 pairs of spreading nerves prominent on the lower: length 4·5 to 9 in., breadth 2 to 3 in.; petiole 1·1 to 2·5 in., smooth, thickened at the apex. *Panicles* meagre, solitary, axillary, slender, puberulous, shorter than the leaves, few-flowered; pedicels about as long as the flowers. *Flower-buds* oblong. *Ocalyx* 5 in. long or more, pubescent on both surfaces but especially on the inner; the tube urceolate, divided at its apex into 5 linear-oblong sub-acute ascending lobes, longer than the tube, slightly connivent but not cohering by their apices, hispidulous on their inner surface. *Male flower*; staminal column shorter than the tube, glabrous; anthers 10, sessile at its apex, elongate-ovate. *Hermaph. flower*: gynophore very short; ovaries 5, boat-shaped, rusty-pubescent, sub-sessile, with a ring of 10 sessile anthers at their base outside: styles almost obsolete; stigmas 5, cylindric, free, radiating, recurved, pubescent beneath. *Follicles* 3 to 5, coriaceous, narrowly



oblong, with short straight beaks, bright red when ripe, puberulous externally, slightly curved, glabrous, shining and ridged internally, 2 in. long and about .5 in. broad. *Seeds* 3 or 4 oblong, black, shining. *Mss.* in Hook. fil. Fl. Br. Ind. i. 357. Pierre Fl. Forest. Coch-Chine t. 192, figs. 1 to 7; Br. in Benn. Pl. Jav. Rar. 230; Miq. Fl. Ind. Bat. i. pt. 2, 174. *S. coccinea*, Jack Mal. Misc. i. 286, not of Roxb.

Penang, Perak, Malacca, Singapore: at low elevations: but not common.

5. *S. HYPOSTICTA*, Miq. Fl. Ind. Bat. Suppl. 399. A shrub or small tree, all parts glabrous except the inflorescence: young branches slender, dark and smooth becoming (by the falling off of the bark) pale and striate. *Leaves* membranous, oblong, to oblong-lanceolate, sometimes slightly obovate, abruptly acuminate or even caudate-acuminate, entire, the base slightly narrowed and rounded, or not narrowed and truncate, emarginate, rarely acute, 3-nerved; both surfaces glabrous, shining: lateral main nerves 3 to 5 pairs, spreading, curved, inarching far from the margin, prominent beneath: length 3.5 to 5.5 in., breadth 1.5 to 2.25 in., petiole 1 to 1.5 in., thickened at base and apex. *Racemes* axillary, solitary, drooping, longer than the leaves, minutely whitish pubescent, with superficial brown stellate hairs: bracteoles linear, longer than the pedicels. *Calyx* with narrowly campanulate tube .25 in. long, densely rufous-pubescent externally and glabrous inside: lobes 5, not quite so long as the tube, linear, spreading, connivent, cohering from some time by their tips, the edges recurved, glandular-pilose inside, sub-pubescent outside. *Male flower*; staminal column short, glabrous, with 8 sessile oblong 2-celled anthers at its apex. *Female flower*: gynophore short; ovaries 4, ovoid, conjoined, shortly tomentose, with ring of 8 sessile anthers at their base. *Style* simple, curved, sparsely villous; stigma large, glabrous, with 4 fleshy oblong-obovoid curved lobes. *Follicles* 2 or 3, coriaceous, bright red when ripe, narrowly oblong, tapering to each end, 2 to 2.25 in. long and .65 in. broad; externally minutely rusty-pubescent; internally glabrous, wrinkled. *Seeds* 4, oblong, pointed, black. Kurz in Journ. As. Soc. Beng. Vol. xlv. pt. 2, p. 120.

Perak; King's Collector, Wray. Nicobars, Kurz.

6. *S. PARVIFOLIA*, Wall. Cat. 1123. A tree 20 to 30 feet high: young branches slender, striate, the older pale, the younger dark-coloured, glabrous. *Leaves* membranous, drying of a pale green, oblong-lanceolate, rarely ovate-oblong, bluntly acuminate, entire; the base acute or rounded, faintly 3-nerved; both surfaces glabrous: main nerves 6 to 8 pairs,

spreading, rather prominent on both surfaces as is the midrib: length 4 to 6.5 in., breadth 1 to 1.75 in.; petiole 1 to 1.75 in., smooth, slender, thickened at the apex. *Racemes* solitary, axillary, much shorter than the leaves, few-flowered, glabrous; flower-pedicels shorter than the flowers, capillary. *Flower-buds* oblong. *Calyx* less than .5 in. long, glabrescent externally, puberulous internally especially on the lobes; tube wide, cylindric, with 5 linear-lanceolate lobes about as long as itself, spreading, incurving and joined for some time by their tips. *Male flower*: staminal column shorter than the tube and bearing at its apex about 12 small oblong anthers with thick connective and diverging cells. *Herm. flower*: gynophore very short, glabrous; ovaries 5, broadly ovate, rusty-pubescent; styles united, recurved, with many white spreading hairs: stigmas clavate, flattened, recurved, spreading. *Follicles* 3 to 5, broadly oblong, with a straight beak, 1 to 1.25 in. long, .6 in. broad. *Seeds* 2, broadly ovoid, black, shining. Mast. in Hook. fil. Fl. Br. Ind. i. 356; R. Brown in Benn. Pl. Javan. Rar. 229; Miq. Fl. Ind. Bat. Vol. i. pt. 2, p. 173.

Penang, Perak, Malacca.

Closely allied to *S. laevis*, Wall.: but with smaller flowers and follicles, and with calyx lobes coherent at their tips.

7. *S. KUNSTLERI*, King, n. sp. A tree 30 to 60 feet high; all parts (except the inflorescence and the tips of the young branches) glabrous; branches with pale smooth striate bark. *Leaves* thinly coriaceous, broadly ovate (or slightly obovate) to oblong or narrowly elliptic, the apex rounded, blunt, sub-acute or very shortly and sub-abruptly acuminate; slightly narrowed to the rounded or sub-truncate, rarely acute, 3 to 5-nerved, base; both surfaces shining; lateral nerves about 7 to 9 pairs, spreading, slightly prominent beneath: length 4 to 9 in., breadth 2 to 4.5 in.; petiole .75 to 2.75 in., slender, glabrous. *Panicles* solitary, narrow, in the axils of (and shorter than) the mature leaves, or supra-axillary, slender; the lateral branches short, 1- to 3-flowered, flocculent-tomentose, rusty; bracteoles lanceolate to ovate, caducous. *Calyx* .3 to .35 in. long, the tube urceolate, densely stellate-tomentose outside, sub-glabrescent inside; lobes 5, shorter than the tube, linear-lanceolate, villous on the inner surface, tomentose on the outer, spreading, connivent and slightly coherent by their tips. *Male flower*: staminal column slender, shorter than the calyx-tube, curved, bearing at its apex 5 to 7 sessile broad anthers. *Hermaph. flower*: gynophore short; ovaries 3, ovoid, villous, with a ring of adpressed sessile oblong anthers at their base: styles distinct, short, thin, sparsely villous; stigmas thick, fleshy, clavate, bent (outwards) on themselves. *Follicles* 2 or 3,

woody, from peach-coloured to carmine when ripe, oblong, rounded at the base, the apex acute and slightly curved; externally rugose (the rugae mostly longitudinal), minutely tomentose, inside smooth; length 3 to 3.5 in., breadth 1.25 to 1.5 in. *Seeds* narrowly ovoid, nearly 1 in. long, black.

Perak; King's Collector Nos. 3259, 7211, 7245, Scortechini No. 1805; at 100 to 300 feet elevation. Distrib. Sumatra; Forbes, No. 2679.

In externals this species closely resembles *S. parviflora*, Roxb. But, after numerous dissections, I conclude that the two species are quite distinct. The ovaries of this are never more than 3, and they are always densely villous; those of *parviflora* are invariably 5, and they are scaly, not villous. The stigmas of this are long and are bent outwards on themselves; these of *parviflora* are short and recurved outwards from their junction with the styles: they are not bent on themselves. The follicles of this are thicker and more woody and the seeds are larger than those of *S. parviflora*. Moreover this has never more than 7 stamens, while *S. parviflora* has 10. The leaves of this are rather thicker in texture and the young branches are thinner and paler than those of *S. parviflora*.

8. *S. PARVIFLORA*, Roxb. Hort. Beng. 50. A tree 20 to 50 feet high; young branches rather thick; the tips ferruginous-tomentose; the bark pale, rough, glabrous. *Leaves* membranous, oval, ovate or obovate-oblong, the apex rather abruptly shortly and bluntly acuminate, entire; the base rounded and slightly cordate, or sub-truncate and emarginate, 5-nerved; both surfaces glabrous, but not shining; the midrib and 7 or 8 pairs of spreading rather prominent lateral nerves sparsely stellate-pubescent on the lower when young; length 4 to 10 in., breadth 2 to 5.5 in.; petiole 1 to 4 in., deciduously rufous-tomentose. *Panicles* about as long as the leaves, slender, the lateral branches short and the flower-pedicels capillary, everywhere covered with rusty stellate tomentum, ebracteolate. *Calyx* .2 in. long with an urceolate tube, the mouth with 5 linear-lanceolate lobes almost as long as the tube, incurved and united by their apices, stellate-tomentose externally, glabrous within. *Male flower*: staminal column shorter than the calyx-tube, bearing at its apex 10 sessile short narrowly ovate anthers with thick connective. *Herm. flower*: ovaries 5, ovoid, scaly, with a ring of anthers at their base: ovules 4 or 5. *Styles* slightly united, slender, sparsely villous, short; stigmas united into a fleshy boldly 5-lobed disc, but easily separable into 5 fleshy flattish recurved stigmas. *Follicles* 1 to 5, thickly coriaceous, brilliant red to orange, pubescent to glabrescent, oblong, shortly beaked, 2.5 to 3.5 in. long and 1.25 to 1.5 in. broad; inside glabrous, shining,

boldly ridged. *Seeds* broadly ovoid, black, .6 in. long, smooth. Roxb. Fl. Ind. iii. 147; Brown in Bennett Pl. Jav. Rar. 232: Wall. Cat. 1121. Kurz For. Fl. Burm. i. 138. Pierre Fl. Forest. Coch-Chine, t. 195 F. *S. Maingayi*, Mast. in Hook. fl. Fl. Br. Ind. i. 359; Pierre Fl. Forest. Coch-Chine, t. 188 A.

Penang, Malacca, Perak; at low elevations, common. Distrib. Burmah and Sylhet in British India; Cochin China.

After careful dissection of the flowers of the types of the two species *S. parviflora*, Roxb. and *S. Maingayi*, Masters, and of flowers of many other specimens, I can come to no other conclusion than that they are one and the same. There is a curious tendency to inequality in size in the leaves, some being twice as large as others rising from the same twig within the distance of an inch. And the panicles usually follow the leaves in the matter of length.

9. *S. SCORTECHINII*, King, n. sp. A tall tree; young branches rather thick, their bark pale, rough, the youngest parts deciduously rusty-pubescent. *Leaves* thinly coriaceous, oblong, slightly obovate, the apex rounded, with an abrupt short blunt point, entire; the base slightly narrowed, rounded or minutely cordate, 3-nerved; upper surface glabrous, shining; the lower slightly paler, dull, thickly dotted with minute reddish flat shining glands, the midrib and 4 to 5 pairs of prominent ascending lateral nerves stellate-pubescent: length 2.5 to 3.5 in., breadth 1.25 to 1.65 in.; petiole .65 to 1 in., deciduously pulverulent-tomentose. *Panicles* racemes-like, axillary, solitary, shorter than the leaves, densely pulverulent-tomentose, rusty; pedicels as long as the buds: bracteoles ovate, .25 in. long, imbricate, caducous. *Calyx* campanulate, divided almost to its base into 5 broadly ovate spreading not connivent lobes, pubescent-tomentose both internally and externally. *Male flower*: staminal column shorter than the calyx, crowned by about 10 short anthers with thick sub-cuneate connective and short divergent cells. *Herm. flower*: *Ovary* 3-celled, obliquely ovoid, pubescent-scaly; ovules 3 or 4 in. each cell. *Styles* connate, pubescent. *Stigmas* 3, large, ovoid, spreading, glabrous, dark-coloured. *Follicles* not seen.

Perak; Scortechinii, No. 2068.

Collected only once, and without fruit.

10. *S. BICOLOR*, Mast. in Hook. fl. Fl. Br. Ind. i. 359. A tree 40 to 60 feet high: young branches rather thin, cinereous, striate, glabrous, rufous-pubescent at the very tips. *Leaves* small, membranous, obovate-oblong, acute or shortly mucronate, entire, slightly narrowed to the minutely 2 to 3-nerved rounded base; upper surface glabrous

when adult, with a few small scattered white stellate hairs when young; under surface pale from a layer of minute whitish hairs, the midrib and 16 to 18 pairs of sub-horizontal lateral nerves rufous-tomentose; length 2.5 to 3 in., breadth 1.2 to 1.4; petiole about 1 in., slender, scaly-tomentose. *Panicles* about as long as the leaves, slender, in the axils of young leaves, pulverulent-tomentose, sub-ferruginous; branches short, spreading. *Calyx* pedicellate, ovoid-oblong, pointed in bud, when adult .3 in. long, widely campanulate, with 5 linear incurved pubescent lobes as long as the tube. *Staminal column* shorter than the tube, glabrous; anthers about 12, sessile at the apex of the column, their connective thick, cuneate, the cells divergent. *Follicles* unknown.

Malacca; Maingay, No. 230 (Kew Distrib.) Perak. Wray, No. 2378.

Recognisable at once by its small leaves, white beneath. The figure named *S. bicolor*, Mast. by Pierre (Fl. Forest. Coch-Chine t. 187) agrees neither with M. Pierre's own description of it; nor with Masters' type-specimen. There may probably have been some printer's blunder in the matter.

11. *S. ANGUSTIFOLIA*, Roxb. Hort. Beng. 50. A small tree: young branches densely velvety rusty-tomentose; ultimately rather pale, glabrous, warted and striate. *Leaves* membranous, oblong-lanceolate rarely ovate-lanceolate, acuminate or acute, entire, slightly narrowed to the rounded 3-nerved base: upper surface glabrous, the lower more or less densely and softly rusty-tomentose: length 4 to 7 in., breadth 1.25 to 2.25; petiole .6 to 1.1 in., rusty-tomentose. *Panicles* solitary, axillary, crowded at the apices of the branches, lax, drooping, longer than the leaves, everywhere densely rusty-tomentose; pedicels much longer than the ovate pointed buds. *Calyx* .2 in. in diam., hispidulous-pubescent everywhere except the tube which inside is glabrous, deeply divided into 5 linear-lanceolate lobes; the lobes longer than the tube, spreading, connivent, cohering by their tips, their edges recurved. *Male flower*: staminal column as long as the tube, glabrous, recurved, bearing at its apex 10 oblong sessile anthers with large connective, the cells slightly divergent. *Herm. flower*: gynophore short, glabrous: ovaries 5, ovoid, rusty-tomentose with a ring of 10 sessile anthers at their base: style short, sparsely pilose: stigmas much longer than style, fleshy, spreading, recurved. *Follicles* 4 or 5, ovate-oblong with a short curved beak, 2.75 in. long and 1.35 in. broad, densely but minutely velvety rusty tomentose outside, smooth shining and rugose inside and with a few small scattered whitish hairs. Roxb. Fl. Ind. iii. 148. Pierre Fl. For. Coch-Chine, t. 190; Wall. Cat. 1133; R. Brown in Benn. Pl. Jav.

Rar. 231. Kurz For. Fl. Burm. i. 138, in part. *S. mollis*, Wall. Cat. 1131; R. Brown in Benn. Pl. Jav. Rar. 231. *S. Balanghas*, L. var. *mollis*, Mast. in Hook. fil. Fl. Br. Ind. i. 358.

Burmah; Griffith No. 578 (Kew Dist.); Helfer Nos. 579, 580; Falconer. Perak, King's Collector, No. 8360.

Roxburgh left in the Calcutta Herbarium an excellent coloured drawing of his *S. angustifolia*. In his Flora Indica he gives a very brief account of the species, drawn up from specimens flowering in the Botanic Garden and which he states came from Nepal. His description is too brief to be of any use: but his figure is so good that I have no hesitation in saying that no species of *Sterculia* collected since Roxburgh's time in any part of the outer Himalaya, or from the plain at its base, is in the least like this plant. I have little doubt that Roxburgh was deceived as to its origin by some changing of labels of the native gardeners at Calcutta (a sublimely inaccurate race!); and that the plant was really received, like so many others during the early years of the garden, from the Straits. Wallich, no doubt deceived by the alleged Himalayan origin of the plant, distributed (as No. 1133 of his list) specimens from the trees of it which were still in his time cultivated in the Calcutta Garden under Roxburgh's name, while specimens collected in Burmah he issued as No. 1131, under the name *S. mollis*, Wall. Pierre's figure above quoted does not agree very well with Roxburgh's, the panicles being by far too short and not nearly hairy enough.

12. *S. RUBIGINOSA*, Vent. Hort. Malmaison, ii. 91. A tree 20 to 50 feet high: young branches rather thick, their apices deciduously rufous-tomentose; the bark pale or brown, striate, glabrous. *Leaves* membranous, obovate-oblong, sometimes ovate-oblong, shortly and abruptly acuminate, entire; narrowed to the acute, rounded or minutely cordate, 3-nerved base: upper surface glabrous, or sparsely stellate-pubescent; the lower stellate-pubescent, most of the hairs pale and minute but these on the midrib and 7 to 10 pairs of spreading stout nerves larger and darker coloured: length 4·5 to 7·5 or rarely 12 in., breadth 2 to 3 in., rarely 4 in.; petiole varying with age from ·3 to 1·5 in., rufous tomentose as are the linear caducous ·5 in. long stipules. *Panicles* solitary in the axils of the crowded young leaves, many-flowered, shorter than, or as long as the leaves, rufous-tomentose like the outer surfaces of the flowers; flower-pedicels spreading, capillary. *Flower buds* broadly ovate. *Calyx* less than ·5 in. long, widely campanulate, divided for half its length or more into 5 lanceolate spreading incurved lobes cohering by their tips, the lobes densely covered inside with white hispidulous hairs. *Male flower*; staminal column longer than the tube or about as

long, glabrous; *anthers* about 10, sessile at the apex of the column, 2-celled, the cells distinct. *Female flower*; gynophore very short; ovaries ovoid, villous (as are the united styles); with 10 sessile anthers at their base; stigma discoid, deeply 5-lobed. *Follicles* 5, coriaceous, crimson when ripe, oblong, shortly beaked, about 2 in. long and 1 in. broad; pubescent externally, glabrous shining and boldly ridged inside. *Seeds* oblong, ovoid, black. Mast. in Hook. fil. Fl. Br. Ind. i. 358: Kurz For. Fl. Burm. i. 138; Pierre Fl. Forest. Coch.-Chine, t. 194 B; Blume Bijdr. i. 82; Br. in Benn. Pl. Jav. Rar. 231; Miq. Fl. Ind. Bat. i. pt. 2, 175. *S. angustifolia*, Jack Mal. Misc. ex Hook. Bot. Misc. i. 287. *S. Jackiana*, Wall. Cat. 1134.

In all the Provinces except the Andaman and Nicobar Islands: at low elevations. Common. Distrib. Java and Sumatra, Cochinchina, Burmah.

*Var. glabrescens*, King: leaves 8 to 12 in. long, by 3 to 4.5 in. broad, softly pubescent beneath when young, much less narrowed to the (always sub-cordate or cordate) base than in the type; panicles much branched and sometimes longer than the leaves. *S. angustifolia*, Kurz (not Roxb.), in part, For. Fl. Burm. i. 138; *S. parviflora*, Kurz (not of Roxb.) Journ. As. Soc. Beng. xliii. pt. 2, p. 116. *S. mollis*, Kurz (? of Wall.) l. c. xlv. pt. 2, p. 120. *S. Balanphas*, Linn. var. *glabrescens*, Mast. in Hook. fil. Fl. Br. Ind. i. 358, in part.

Andaman Islands; Helfer (Kew Distrib. No. 595); Kurz, Prain, Bot. Gard. Collectors. Nicobars, Kurz. Great Cocos, Prain. There are no Mergui or Eastern Peninsula specimens of this at Calcutta, and I believe the variety to be confined to the Islands above named.

In this species the petioles lengthen with the age of the leaf, many young leaves having petioles less than .25 in. long, while in old leaves the length varies from 1 to 1.5 in. And there is considerable variability in the size of the blade. Moreover, while in some the upper surface of the leaves is perfectly glabrous (except the midrib which is almost invariably rusty-tomentose), in others it is rough and scabrous from the presence of scattered stellate hairs. The next species (*S. ensifolia*, Mast.) has, in my opinion, a very poor claim to specific rank; and I think it would be better to treat it a shrubby variety of this with narrower leaves and longer flowers. *S. parviflora*, Roxb. also differs very little from this, and might be reasonably enough regarded as a form of it with broader more glabrous cordate leaves with fewer nerves.

13. *S. ENSIFOLIA*, Mast. in Hook. fil. Fl. Br. Ind. i. 359. A shrub or small tree: young branches and petioles densely ferruginous-tomen-

tose. *Leaves* membranous, oblong-lanceolate or oblanceolate, shortly caudate-acuminate, entire, the base rounded, sometimes minutely cordate, rarely acute; upper surface glabrous, the midrib alone tomentose; under surface sparsely rusty-tomentose, the midrib and 8 to 10 pairs of spreading lateral nerves prominent: length 6 to 12 in., breadth 1·25 to 3·5 in., petiole ·3 to 1·5 in.; stipules erect, linear, half as long as the petiole, deciduous. *Panicles* or *racemes* axillary, solitary, lax, few-flowered, rusty-tomentose, hardly so long as the leaves; bracteoles linear, shorter than the pedicels. *Calyx* ·5 or ·6 in. long, broadly campanulate, pubescent on both surfaces, the tube much shorter than the linear-lanceolate spreading lobes the tips of which curve inwards and cohere. *Male flower*; staminal column longer than the calyx-tube but much shorter than its lobes, glabrous, curved, bearing at its apex 10 2-celled, oblong, nearly sessile, anthers. *Female flower*; gynophore very short: ovaries 5, ovoid, rusty-villous, surrounded at the base by 10 sub-sessile stamens. *Styles* short, united, densely covered with white hairs; stigmas united into a boldly 5-lobed disc. *Follicles* 1 to 5, shortly stalked, narrowly oblong, tapering to each end, the apex with a hooked beak, coriaceous, brownish-velvety, red when ripe, 2 to 2·5 in. long and ·75 in. broad. *Seeds* oval, black, smooth. Pierre Fl. Forest. Coch-Chine t. 194 C. *S. angustifolia*, Jack (not of Roxb.) Mal. Misc. ex Hook. Bot. Mis. i. 287.

Penang, Perak, at low elevations, common. Distrib. Burmah.

I have no doubt whatever that this is the plant described by Jack as the *S. angustifolia* of Roxb.

14. *S. PUBESCENS*, Mast. in Hook. fil. Fl. Br. Ind. i. 357. A tree, the younger parts rusty-pubescent. *Leaves* oblong, obtuse, or abruptly acuminate, entire, the base cordate; upper surface glabrous; lower densely and minutely pubescent, the nerves stellate-pilose: length 4 to 6 in., breadth 2 to 2·5 in.; petiole 1·25 in., sulcate: stipules subulate, ·25 in. long. *Panicle* erect, as long as or longer than the leaves, much branched: ultimate pedicels jointed, pubescent, spreading. *Calyx* ·25 in. long, campanulate; the lobes triangular acute, as long as the tube, hairy within. *Ovary* globose, downy.

Malacca, Maingay.

Except by Maingay's two specimens in the Kew Herbarium, this species is unknown. Specimens of it in good flower and in fruit are much wanted, so that a completer description than the foregoing may be prepared.

15. *S. COLORATA*, Roxb. Hort. Beng. 50. A tree 30 to 60 feet



high; young branches thick, rough, rather pale, glabrous. *Leaves* thinly coriaceous, roundish or reniform, usually palmately 3 to 5-lobed, the lobes triangular, acuminate; base deeply cordate, 5 to 7-nerved; both surfaces pulverulent-pubescent when young, glabrous when adult; length 4.5 to 9 in., breadth 5 to 12 in.; petiole 3.5 to 8 in., puberulous; stipules lanceolate, caducous. *Flowers* in axillary panicles or racemes from the axils of last year's fallen leaves, 2.5 to 4 in. long, densely covered, as is the exterior of the flowers, with coral-red, scaly tomentum. *Calyx* .75 in. long, funnel-shaped, curved, the mouth with 5 acute short triangular teeth, puberulous internally, villous at the base. *Staminal column* as long as, or longer than the calyx, slightly flattened, minutely furfuraceous-pubescent: anthers 20 to 25, sessile at the apex of the column, oblong, closely surrounding the 5 flask-shaped ovaries; styles 5, short, recurved: stigmas acute. *Follicles* 2 to 3 in. long, membranous, glabrous, veined, stipitate, open from an early age and bearing on their edges usually 2 smooth oval seeds. Roxb. Cor. Pl. i. 26, t. 25; Fl. Ind. iii. 146; Mast. in Hook. fil. Fl. Br. Ind. i. 359; Pierre Fl. Forest. Coch-Chine, t. 199; Kurz For. Fl. Burm. i. 138; Brand. For. Flora N. W. Ind. 34; Wall. Cat. 1119; Hook. Ic. Pl. 143; Dalz. & Gibs. Bomb. Fl. 23; W. & A. Prodr. i. 63. *Firmiana colorata*. Br. in Benn. Pl. Jav. Rar. 235; Thwaites Enum. 29. *Erythropsis Roxburghiana*, Scott. & Endl. Melet. Bot. 33.

Andamans; Kurz, Prain. Distrib. India, Ceylon.

16. *S. FULGENS*, Wall. Cat. 1135. A tree 30 to 70 feet high; young branches rather thick, with smooth dark bark, at first pubescent, ultimately quite glabrous. *Leaves* large and with long petioles, thinly coriaceous, rotund with 5 shallow acuminate lobes, the base cordate: upper surface glabrous, harsh to the touch: lower densely and minutely stellate-pubescent, palmately 7-nerved, the nerves prominent beneath: length and breadth 15 to 18 in.; petiole 15 to 20 in., sulcate, minutely puberulous. *Racemes* or *panicles* 3 to 4 in. long, from the axils of last year's leaves, densely covered with orange or golden-yellowish scurfy tomentum as are the outer surfaces of the flowers. *Calyx* 1.25 in. long, funnel-shaped, slightly curved, the mouth with 5 short triangular teeth; internally minutely velvety-puberulous with a ring of long matted hair near the base. *Staminal tube* .5 in., longer than the calyx, 5-angled, sulcate, minutely tomentose; anthers 20, sessile, oblong, 1-celled, embracing the 5 flask-shaped ovaries; styles short, reflexed: stigmas acute. *Follicles* unknown. Mast. in Hook. fil. Fl. Br. Ind. i. 360; Kurz For. Fl. Burm. i. 139; Journ. As. Soc. Beng. pt. 2, 1874, p. 117; Wall. Cat. 1135; *Firmiana colorata* var.  $\beta$ , Br. in Benn. Pl. Jav. Rar. 235; Miq. Fl. Ind. Bat., i. pt. 2, 178.

Perak; King's Collector, No. 8673, Scortechini. Distrib. W. Sumatra, Forbes, No. 2105; Java, Burmah; Wallich.

There is no doubt this comes very close to *S. colorata*, Roxb. of which it might possibly be better to treat it as a variety characterised by larger flowers, with much more exserted staminal column, larger leaves, thinner and dark-coloured branchlets. Wallich, however, who saw the tree growing, regarded it as a species; and Robert Brown (Pl. Jav. Bar. p. 235), while treating it as a variety of *colorata*, remarks that it is probably worthy of specific rank. This plant (whether species or variety) is never found in British India proper. Its most northerly limit is Tenasserim, and from thence it extends southward into the Malayan Archipelago. In the Flora of British India, Dr. Masters gives the distribution of this as "Tropical Western Himalayan." The plant, however, which occurs in tropical valleys in that region is just as different from *S. fulgens*, Wall., as that is from *S. colorata*, Roxb. It is the tree to which Wallich gave the name *S. pallens*; and which he published (without describing) in Voigt's Hort. Suburb, Calcutta, p. 105. The leaves of *S. pallens* resemble those of *colorata* in shape; but their under surface is covered with dense pale yellow stellate tomentum. The calyx has a much wider mouth than that of *colorata*, and (like the axis and pedicels of the panicle) is densely covered with a very pale yellow tomentum, while the tomentum of *colorata* is of a vivid coral red. *S. pallens* is confined to the Western Himalaya, just as *S. fulgens* is limited to Burmah and Malaya.

17. *S. ALATA*, Roxb. Hort. Beng. 50. A tree 80 to 150 feet high; young branches rather stout, striate, glabrous. *Leaves* membranous, broadly ovate or ovate-oblong, acute or shortly acuminate, entire; the base deeply cordate, 5 to 7-nerved, some of the basal nerves pinnate on one side; both surfaces glabrous; lateral nerves 4 pairs, prominent on both surfaces as are the midrib and basal nerves; length 4 to 12 in., breadth 3 to 8 in., petiole 1.5 to 7 in.: stipules minute, subulate, caducous. *Racemes* from the axils of previous year's fallen leaves, usually in pairs, sometimes solitary, rarely terminal, about as long as the petioles, flocculent, rusty-tomentose, as are the flowers externally; bracts 3 to each flower, ensiform, caducous. *Calyx* .75 in long, campanulate, deeply divided into 5 or 6 thick, fleshy, lanceolate segments. *Male flower*; staminal column thin, cylindric, much shorter than the calyx, glabrous, bearing at its apex 25 elongate anthers in five groups of 5 each; ovaries imperfect. *Female flower*; staminodes in 5 phalanges, sessile, embracing the bases of the 5 sub-ovate, multi-ovulate-ovaries; stigmas broad, emarginate. *Follicles* pedunculate, woody, pulverulent.

pubescent, 5 in. in diam., sub-globular, slightly compressed. *Seeds* oblong, compressed, the testa spongy, 1 in. long, with a large obovate thick spongy terminal wing 2·5 in. long and 1·25 broad. Roxb. Corom. Pl. iii. 84, t. 287; Fl. Ind. iii. 152; Kurz Fl. Br. Burm. i. 134; Pierre Fl. Forest. Coch-Chine, t. 196; Wall. Cat. 1125. *Pterygota Roxburghii*, Schott & Endl. Melet. *P. 'alata*, Br. in Benn. Pl. Jav. Rar. 234. *S. coccinea*, Wall. Cat. 1122, partly. *S. Heynii*, Beddome Flor. Sylvat. t. 230.

Perak, Scortechini: Andamans, Kurz. Distrib. Brit. India, Cochin-China.

18. *S. LINEARICARPA*, Mast. in Hook. fil. Br. Ind. i. 360. A tree 60 to 80 feet high: young branches thick, striate, deciduously pulverulent-tomentose, leaf-cicatrices large. *Leaves* coriaceous, ovate-orbicular, blunt or very slightly narrowed at the apex, edges entire, base deeply cordate, 7-nerved; upper surface glabrous, shining; lower deciduously pulverulent, hairy, almost glabrous when old, minutely reticulate, the midrib and 4 or 5 pairs of lateral nerves prominent: length and breadth 6 to 12 in.; petiole 2·5 to 6 in., sulcate, pulverulent-tomentose. *Panicles* axillary, solitary, stout, erect, as long as or longer than the leaves, rusty pulverulent-tomentose as are the outer surfaces of the calyces, the lateral branchlets short; bracteoles numerous, rotund, concave, caducous; flower-buds globose, sessile. *Calyx* rotate, the tube 1 in. long, with 5 slightly longer ovate acute lobes, tomentose externally, glabrous within. *Staminal column* not so long as the calyx-tube, glabrous; anthers 10, each with a short filament, cuneate, 2-celled; ovaries (rudimentary in some flowers) about 3, free, each 1 or 2-ovulate; style short; stigma entire, small. *Follicles* (? ripe) linear-lanceolate, 3 to 4 in. long and 6 in. broad, stipitate, longitudinally ridged and covered outside and inside with yellowish tomentum as is also the single oblong seed.

Malacca, Maingay. Perak; Scortechini, King's Collector.

The flowers and follicles of this are, in my opinion, those of *Scaphium* rather than of *Firmania*, to which section Dr. Masters has referred it.

19. *S. SCAPIGIGERA*, Wall. Cat. 1130. A tree 90 to 120 feet high: young branches rather thick; the bark pale, minutely warted and striate, glabrous. *Leaves* coriaceous, glabrous, ovate to oblong-ovate, sub-acute or bluntish-acuminate, entire; the base rounded or sub-truncate, often faintly cordate or emarginate, 3 to 5-nerved; main nerves 2 to 4 pairs, sub-erect, prominent on both surfaces; length 5 to 10 in., breadth 2·75 to 4·5 in.; petiole 2 to 5 in., thickened at both ends. *Panicles* only at

the ends of the branchlets, puberulous, shorter than the petioles, robust, with many short spreading branches, many-flowered; pedicels short, pubescent; bracteoles subulate, deciduous. *Calyx* from '3 to '4 in. long, deeply 5-lobed and almost rotate when expanded, stellate-puberulous externally, glabrous internally, the lobes lanceolate. *Male flower* with 15 to 30 anthers almost sessile round the apex of the column and surrounding the rudimentary villous ovary. *Female flower*; ovaries 5, bi-ovulate; styles united; stigma 5-lobed. *Follicles* 1 to 5, on rather stout pubescent stalks, when ripe 6 to 8 in. long and 1.25 to 2.5 in. broad, membranous, boat-shaped, gibbous about the middle, conspicuously veined and more or less puberulous externally especially on the nerves. *Seeds* 1 (rarely 2), ovoid, glabrous, shining, '5 to 1 in. long, attached to the very base of the follicle. Mast. in Hook. fil. Fl. Br. Ind. i. 361; Kurz For. Fl. Burm. i. 140; Pierre Fl. Forest. Coch-Chine, t. 201. *Scaphium Wallichii*, R. Br. in Benn. Pl. Jav. Rar. 226.

Malacca, Griffith. Distrib. Sumatra, Burmah.

M. Pierre is in doubt whether his fine figure (l. c. t. 201), represents really the true plant of Wallich. In my opinion it does so most decidedly: R. Brown was right in describing the ovaries as five, and there is a specimen in the Calcutta Herbarium with 5 follicles.

20. *S. AFFINIS*, Mast. in Hook. fil. Fl. Br. Ind. i. 361. A tree: young branches rather stout, rough, dark in colour, the leaf cicatrices large, the very youngest minutely rusty-tomentose. *Leaves* thinly coriaceous, elliptic-oblong, with rather straight edges; the apex broad, suddenly acute; the base truncate (sometimes obliquely so), 3-nerved; both surfaces glabrous, the upper shining, the lower pale and rather dull: main nerves 6 or 7 pairs, conspicuous beneath as is the midrib; length 5 to 9 in., breadth 4.75 to 5.5 in.; petiole 4.5 in., thickened at each end. "*Panicle* erect, as long as the leaves, its branches downy, flattened or angular; peduncles thickly striated, angular, sub-pilose, spreading; ultimate pedicels downy, densely crowded. *Flowers* very small, the buds ovoid. *Flowers* .25 in. *Calyx-lobes* ovate, longer than the funnel-shaped tube. *Follicle*, a span long, falcate, leafy, glabrescent, shining within. *Seeds* .65 in. long, solitary, oblong, black." *Scaphium affine*, Pierre Fl. Forest. Coch-Chine, t. 195 E.

Malacca; Maingay, No. 225 (Kew. Distrib.)

The only Maingayan specimen of this in the Calcutta Herbarium consists of leaves only, with a single detached fruit; and I have seen no specimen from any other collector. The foregoing description (as regards inflorescence, flower and fruit) is therefore copied verbatim from Masters (in F. B. I. l. c.).

21. *S. CAMPANULATA*, Wall. A tree 50 to 60 feet high: young branches rather slender, rusty-tomentose, soon becoming glabrous. *Leaves* membranous, broadly ovate, shortly acuminate, entire; the base usually deeply cordate, 3 to 7-nerved; sometimes 3 to 5-lobed; lateral nerves 3 or 4 pairs; upper surface glabrous, the midrib and nerves pubescent or puberulous; lower surface pubescent; length 4 to 6 in., breadth 3·75 to 5·5 in.; petiole 2·25 to 5 in. puberulous: stipules lateral, subulate, caducous. *Panicles* 3 or 4 in. long, in clusters of 2 or 3 at the apices of the branches, few-flowered, glabrous, erect, sub-corymbose; pedicels jointed, about 3 in. long, bracteoles caducous. *Calyx* widely campanulate, more than 75 in. across, green, pruinose, glabrous, veined, its mouth cut half-way down into 5 triangular velvety-edged lobes: *Staminal column* pubescent below. *Ovaries* gibbous at the apex: styles short, cohering; stigmas filiform, recurved: ovules 2, erect. *Follicles* 3 to 6, on slender puberulous stalks, membranous, veined, 2 to 3 in. long, boat-shaped, saccate with a sub-terminal lanceolate wing. *Seeds* sub-globose, with a shining crustaceous testa, 5 in. long or less. *Mast.* in Hook. fil. Fl. Br. Ind. i. 362; Kurz For. Fl. Br. Burm. i. 139. *Pterocymbium Javanicum*, Br. in Bonn. Pl. Jav. Rar. 219, t. 45; Miq. Fl. Ind. Bat. i. pt. 2, 179. *Pt. campanulatum* and *Javanicum*, Pierre, Fl. Forest. Coch.-Chine, t. 195.

Perak; Fr. Scortechini, King's Collector. Nicobars, Kurz. Distrib. Malayan Archipelago, Burmah.

M. Pierre (l. c.) remarks that, in his opinion, the two species *campanulatum* and *Javanicum*, although closely related, are distinct species; but he does not mention the characters on which he relies for separating them. After dissecting many flowers of the tree (until recently growing in the Botanic Garden, Calcutta), on which Wallich founded his species *campanulatum*, I cannot see any respect in which they differ from Robert Brown's minute and excellent description and figures of *Pt. Javanicum*. I therefore agree with Dr. Masters in considering the two as one and the same species.

22. *S. TUBULATA*, Mast. in Hook. fil. Fl. Br. Ind. i. 362. A tree; young branches about as thick as a goose-quill, tomentose at the very points, the bark dark and rather rough. *Leaves* thinly coriaceous, elliptic-oblong, with a short abrupt rather blunt apiculus; edges entire; the base broadly rounded or sub-truncate, very slightly cordate; when adult both surfaces glabrous except the midrib and main nerves which are minutely rusty-tomentose; main nerves 5 to 7 pairs, spreading, slightly prominent below: length 4 in., breadth 1·75 in.; petiole 75 in. slender, deciduously rusty-tomentose. *Oymes* terminal, as long as the

leaves, many-flowered. *Calyx* .5 in. long, glabrous, narrowly tubular below, the mouth slightly expanded and with 5 ovate-lanceolate lobes shorter than the tube. *Staminal column* pilose; anthers in a ring. *Ovaries* 5; styles inflexed, cohering by their tips. *Follicles* 5, from 2 to 3 in. long and 1 in. broad, on tomentose stalks, oblong, acute, dilated at the base. *Seed* ovoid.

Malacca, Maingay.

At once distinguished by the singular calyx, tubular in its lower, lobed and spreading in its upper, half.

## 2. *TARRIETIA*, Blume.

Tall trees. *Leaves* digitate or simple, glabrous or scaly. *Flowers* unisexual, paniced. *Calyx* tubular, small, 5-toothed. *Petals* 0. *Staminal-column* short, bearing a ring of 10-15 very densely clustered anthers, cells parallel. *Ovary* of 3-5 nearly free carpels opposite the sepals; styles as many, short, filiform, stigmatose within; ovules 1 in each cell. *Ripe carpels* of stellately spreading samaras with long falcate wings. *Seeds* oblong; albumen bipartible; cotyledons flat; radicle next the hilum.—Distrib. Known species 5 or 6, Australian and Malayan.

*Leaves* digitately compound.

Under-surface of leaflets persistently

stellate-tomentose ... .. 1. *T. Perakensis*.

Under-surface deciduously tomentose,

the hairs simple ... .. 2. *T. Penangiana*.

*Leaves* simple.

Fruit glabrous ... .. 3. *T. simplicifolia*.

„ tomentose. ... .. 4. *T. Kunstleri*.

1. *T. PERAKENSIS*, King, n. sp. A tree 40 to 60 feet high: young branches, petioles, petiolules, under surface of leaves (when young) and inflorescence with minute deciduous rusty tomentum. *Leaves* digitately compound; leaflets 5 or 6, the lower smaller, obovate-elliptic to obovate-rotund, shortly and rather abruptly acuminate, the edges entire, slightly wavy; the base narrowed; upper surface minutely areolate, glabrous except the very minutely tomentose midrib and nerves; lower glabrous except the midrib: main nerves 10 to 14 pairs, stout and prominent beneath: length of the middle leaflet 4.5 to 5.5 in., of the lower 2 to 3.5 in.: breadth of the middle 2 to 3 in., of the lower 1.25 to 1.5 in.; petiolules .5 to 1 in.; petioles .3 to .45 in. *Inflorescence* in solitary, axillary, cymose racemes or panicles more than half as long as the

leaves, much crowded at the points of the branches. *Flowers* .15 in. long: pedicels slender, three times as long. *Calyx-tube* tomentose externally, sparsely pubescent within; *staminal tube* less than half its length. *Female calyx* rather longer than the male, otherwise the same: stamens 0: ovaries 5, obliquely ovoid, glabrous, each with a pubescent conic style crowned by a small hooked stigma. *Ripe fruit* compressed-ovoid, 1.25 to 1.5 in. long, and 1 to 1.15 in. in diam., glabrous, the wing falcate, 2 in. long and .5 in. broad, striate.

Perak, at low elevations; King's Collector, Penang, Curtis, No. 2229.

~~In its leaves this much resembles~~ *T. Javanica*, Bl. (*Rumphia* iii. t. 127, fig. 1); but the leaves of Blume's plant are smaller and have more wavy edges. The flowers, however, of the two differ much in size, those of this being twice as large as the flowers of *T. Javanica*.

2. *T. CURTISII*, King, n. sp. A tree 20 to 40 feet high; young branches, petioles, petiolules and under surfaces of leaves densely covered with rusty stellate, non-deciduous tomentum. *Leaves* digitately 5 or 6-foliolate, the lower smaller, obovate, entire, wavy, apex retuse, base acute; upper surface minutely areolate, glabrous except the stellate-tomentose midrib and main nerves; under surface, and especially the midrib, stellate-tomentose: main nerves 9 or 10 pairs, spreading, prominent beneath: length of the middle leaflet 3.5 to 4.5 in., of the lower 1.5 to 2.5 in.; breadth of the middle 2.25 to 2.5 in., of the lower .8 to 1.5 in., petiolules .5 to .75 in., petioles 2 to 2.5 in. *Inflorescence* in solitary, axillary, cymose racemes or few-flowered panicles, more than half as long as the leaves. *Ripe fruit* glabrous, compressed-ovoid, 1 in. long and .8 in. broad; wing narrowly falcate, 1.25 in. long and .25 in. broad, striate.

Penang at 2000 feet: Curtis No. 1427.

This is known only by Curtis's scanty specimens which are in fruit only. Its flowers are unknown. In leaves it closely approaches *T. Perakensis*, but the tomentum is stellate and persistent; whereas in *T. Perakensis*, the hairs are simple and deciduous. The leaflets of this are also smaller, fewer-nerved, more decidedly obovate, less elliptic than in *T. Perakensis*, and they are mucronate rather than acuminate.

3. *T. SIMPLICIFOLIA*, Mast. in Hook. fil. Fl. Br. Ind. i. 362. A tree, young branches pale, sub-glabrous, striate. *Leaves* simple, coriaceous, elliptic or obovate-elliptic, apex truncate or emarginate, shortly mucronate, entire, rather suddenly narrowed at the base or rounded; upper surface glabrous, shining; lower dull, rusty, minutely puberulous,

and slightly scaly; main nerves 16 to 20 pairs, prominent below, spreading; length 4.5 to 7 in., breadth 3 to 4.5 in.; petiole 2 to 3 in., thickened towards the apex. *Cymes* axillary, solitary, many-flowered, 1.5 to 2.5 in. long, minutely rusty-tomentose. *Flowers* 1 in. long; the pedicels shorter, stout. *Calyx-tube* campanulate, minutely tomentose externally, puberulous within: staminal tube short. *Fruit* (including wing) 3 in. long, obliquely spatulate, glabrous.

Malacca; Griffith, Maingay (Kew Distrib.) No. 231.

4. *T. KUNSTLERI*, King, n. sp. A tree 50 to 70 feet high: young branches petioles and peduncles minutely stellate-pubescent and lenticellate. *Leaves* elliptic to obovate-oblong, blunt, mucronate, entire, the base rounded or slightly narrowed: upper surface smooth, shining; the lower pale, sparsely stellate-puberulous on the midrib and nerves, otherwise (under a lens) minutely puberulous: main nerves 7 to 10 pairs, ascending, prominent beneath. *Fruit* at the apex of a solitary stellate-hairy peduncle, ovoid with an oblique sub-spatulate wing, minutely but densely velvety fulvous-tomentose; length of body 1 in. or more; wing about the same length and .6 in. broad.

Perak, near Laroot; King's Collector No. 7581.

Flowers of this are at present unknown. The leaves are at once distinguished from those of *T. simplicifolia* by their pale under surface, and the fruits by their tomentum.

### 3. *HERITIERA*, Aiton.

Trees. *Leaves* coriaceous, simple, scaly beneath. *Flowers* small, unisexual, in axillary panicles. *Calyx* 5, rarely 4-6 toothed or cleft. *Petals* 0. *Anthers* in a ring at the top of the column, cells 2, parallel. *Ovaries* 5-6, almost free: style short, stigmas 5, thick; ovules solitary in each cell. *Ripe carpels* woody, indehiscent, keeled or winged. *Albumen* 0; cotyledons thick; radicle next the hilum.—A genus of 6 or 7 species, natives of the Tropics of the old world, and of Australia.

*H. LITTORALIS*, Dryand. in DC. Prod. i. 484. A tree: young branches stout, rough. *Leaves* oblong or elliptic, the apex rounded or acute; the edges entire; base rounded or slightly cordate; lower surface pale; main nerves 7 to 9 pairs, slightly prominent beneath: length 5 to 10 in., breadth 2.25 to 4 in., petiole .5 to .75 in.: stipules lanceolate, caducous. *Flowers* .2 in. long, in many-flowered axillary cymose panicles shorter than the leaves. *Calyx* 5-toothed, puberulous, half as long as the pedicel. *Ripe fruit* 1.5 to 3.5 in. long, woody, compressed ovoid, boldly keeled at apex and on dorsum, glabrous, shining. Mast. in Hook. fil. Fl.



Br. Ind. i. 363; Kurz For. Fl. Burm. i. 140; Pierre Fl. Forest. Coch-Chine, t. 203; Miq. Fl. Ind. Bat. i. pt. 2, p. 179; Blume Bijdr. 84; Roxb. Fl. Ind. iii. 142; W. & A. Prodr. i. 63; Thwaites Enum. 28; Br. in Benn. Pl. Jav. Rar. 237; Miq. Fl. Ind. Bat. i. pt. 2, p. 179. *H. Fomes*, Wall. Cat. 1139, partly. *Balanopteris Tothila*, Gaertn. Fruct. ii. 94, t. 99.

All the Provinces, on the coasts. Distrib. Malayan Archipelago and coasts of the tropics of the old world generally, and of Australia.

The plant originally issued by Wallich as *Trochetia contracta* (Cat. No. 1162) and afterwards named by him *Heritiera macrophylla*, (Pierre l. c. t. 204) has by some writers been reduced to *H. littoralis*. But Wallich's species was originally found in the interior of Burmah, and it has since been found in Cachar, far from the sea coast to which *H. littoralis* is strictly confined. *H. macrophylla* has moreover leaf-petioles more than twice as long as those of *H. littoralis*, and its fruit is warted and not smooth. I believe *H. macrophylla* to be a perfectly distinct species; as is also, in my opinion, the other Sylhet and Khasia small-leaved plant which Wallich issued as *H. acuminata*. (Cat. No. 7836.)

#### 4. KLEINHOVIA, Linn.

A tree. *Leaves* 5 to 7-nerved and often cordate at the base. *Inflorescence* a terminal, lax, cymose panicle. *Bracteoles* small. *Sepals* 5, much longer than the petals, linear-lanceolate, deciduous. *Petals* 5, unequal, the upper short, ovate-round, saccate, the middle pair concave and obliquely oblanceolate, the lower pair flat with convolute edges. *Stamens* 20, in 5 phalanges of 3 each with five solitary, free, often non-antheriferous, filaments between the phalanges; the filaments of all conjoined below into a long, externally hairy, narrowly cylindric tube which surrounds the gynophore: anthers 4-celled, divergent. *Ovary* at the apex of the long gynophore and surrounded by the staminal tube, 5-lobed, 5-celled. *Capsule* turbinate-pyriform, membranous, inflated, 5-celled, loculicidal. *Seeds* 1 or 2 in each cell, tubercled: cotyledons convolute, radicle inferior. Distrib. One species. Tropics of the old world.

K. HOSPITA, L. Spec. 1365. *Leaves* ovate-rotund, acuminate, entire, palmately 3-5-nerved at the base, glabrous: length 3 to 6 in., breadth 2.5 to 5 in., petiole 1.5 to 2.5 in. DC. Prodr. i. 488; W. & A. Prodr. i. 64; Roxb. Fl. Ind. iii. 141; Miq. Fl. Ind. Bat. i. pt. 2, 186; Blume Bijdr. 86; Hassk. Pl. Jav. Rar. 313; Mast. in Hook. fil. Fl. Br. Ind. i. 364. Pierre Fl. Forest. Coch-Chine, t. 177.

In all the Provinces, but usually planted. Distrib. Malaya, Australasia, Br. India.

Apparently a variable plant. Dr. Masters (in Oliver's *Flora of Trop. Africa*, i. 226), describes the African specimens as having no stamens or staminodes alternating with the 5 phalanges of stamens. A specimen in the Calcutta Herbarium from Java has the under surface of the leaves softly hairy.

## 5. *HELICTERES*, Linn.

Trees or shrubs, more or less stellate-pubescent. *Leaves* simple. *Flowers* axillary, solitary or fascicled. *Oalyx* tubular, 5-fid, often irregular. *Petals* 5, clawed, equal or unequal, the claws often with ear-shaped appendages. *Staminal column* surrounding the gynophore, 5-toothed or lobed at the apex; anthers at the top of the column, 2-celled. Five staminodes below the apex of the column. *Ovary* at the top of the column, 5-lobed, 5-celled; styles awl-shaped, more or less united, slightly thickened and stigmatose at the tips; ovules many in each cell. *Follicles* spirally twisted, or straight. *Seeds* tubercled; albumen scanty; cotyledons leafy, folded round the radicle which is next the hilum.—*Distrib.* About 30 species, natives of the tropics of both hemispheres.

Fruit spirally twisted ... 1. *H. Isora*.

Fruit not twisted.

*Leaves* ovate to oblong-lanceolate,  
oblique; fruit more than 1 in. long ... 2. *H. hirsuta*.

*Leaves* lanceolate or oblanceolate, not  
oblique: fruit less than 1 in. long ... 3. *H. angustifolia*.

1. *H. ISORA*, Linn. Spec. 1366. A shrub or small tree; young branches minutely tomentose. *Leaves* ovate-rotund, oblique; the apex rounded, abruptly acuminate; the edges irregularly serrate-dentate, sometimes lobed; the base cordate or rounded, rarely acute, palmately 5- to 7-nerved; upper surface scabrous, minutely hispid; lower pubescent or tomentose; length 2 to 4 in., breadth 1·25 to 3 in.; petiole ·3 in. long, tomentose; stipules linear, about as long as the petioles. *Flowers* axillary, solitary, or in few-flowered minutely bracteolate cymes, 1·5 in. long. *Oalyx* narrowly campanulate, laterally compressed, 2-lipped, 5-toothed, tomentose outside. *Petals* reflexed, the lower two much shorter and broader than the three upper. *Staminal column* longer than the petals, curved, very narrowly cylindric, bearing at its apex 10 to 12 elongate-ovate stamens, and more internally 5 flat bifid staminodes. *Ovary* ovoid, sulcate, tomentose: styles slender, glabrous, united. *Fruit* cylindric, twisted, crowned by the persistent styles, pubescent; 1·5 in. long, ·4 in. in diam. Mast. in Hook. fl. Fl. Ind. i. 365; Bl.

Bijdr. 79; Pierre Fl. Forest. Coch-Chine, t. 208, figs. 12 to 25; DC. Prodr. i. 475; Roxb. Fl. Ind. iii. 143; W. & A. Prodr. i. 60; Wight Ic. t. 180; Miq. Fl. Ind. Bat. i. pt. 2, 169; Kurz For. Fl. Burm. i. 142; Brand. For. Flor. 34. *H. chrysocalyx*, Miq. in Pl. Hohen. *Isora corylifolia*, Wight, Hassk. in Tijds. Nat. Gesch. xii. 107.

Perak; and probably in all the provinces. Distrib. Brit. India.

2. *H. HIRSUTA*, Lour. Fl. Coch-Chine, 648. A shrub 6 or 8 feet high; the young branches velvety-tomentose. *Leaves* ovate, or ovate-rhomboid, sub-oblique (oblong to oblong-lanceolate in vars.) acuminate, irregularly erose-serrate; the base sub-truncate or rounded, rarely sub-emarginate; upper surface scabrid-pubescent, the midrib and nerves tomentose; lower velvety-tomentose; nerves 4 or 5 pairs, prominent beneath; length 3·5 to 6 in., breadth 1·75 to 2·5 in.; petiole ¼ in., tomentose. *Cymes* scorpioid, few-flowered, axillary, solitary, twice as long as the petiole. *Flowers* ¾ in. long. *Calyx* narrowly cylindric-campanulate, coarsely stellate-tomentose externally, the mouth with 5 acute unequal teeth. *Petals* linear, sub-spathulate, two rather broader than the others with slight horn-like appendages about the middle and all longer than the calyx and about as long as the stamens. *Staminal column* and pistils as in *H. Isora*. *Fruit* cylindric, acuminate, not twisted, the carpels firmly coherent; externally densely covered by long villous and stellately pilose soft prickles, 1·2 in. long and ⅓ in. diam. Pierre Fl. Forest. Coch-Chine, t. 208, figs. 1 to 11; Kurz For. Fl. Burm. i. 143. *H. hirsuta*, Bl. Bijdr. 80. *H. spicata*, Colebr. in Wall. Cat. 1182; Mast. in Hook. fil. Fl. Br. Ind. i. 366; *Oudemansia hirsuta*, Miq. Fl. Ind. Bat. i. pt. 2, p. 171; Hassk. Retzia, i. p. 184; *Orthothecium hirsutum*, Hassk. Pl. Jav. Rar. 308.

Selangore, King's Collector. Penang, Curtis; and probably in the other provinces at low elevations. Distrib. Malayan Archipelago, China, Brit. India.

Var. *oblonga*, (species Wall. Cat. 1183). *Leaves* oblong, 5 or 6 in. long and 1·35 to 1·75 in. broad, sparsely stellate-tomentose beneath.

Penang, Andamans.

Var. *vestita*, (species Wall. Cat. 1844). *Leaves* oblong-lanceolate, oblique at the base; 3·5 to 5·5 in. long and 1 to 1·5 in. broad.

Burmah: ? Andamans.

There seems to be little doubt that Loureiro and Blume independently of each other gave this species the same specific name. Wallich's distribution of it under Colebrooke's MSS. name *spicata* took place many years subsequently, and that name must (although adopted by Dr. Masters) I think fall to the ground.

3. *H. ANGUSTIFOLIA*, L. sp. 1366. A shrub 4 to 6 feet high: young branches, petioles, under surfaces of leaves and peduncles minutely and more or less densely pubescent. *Leaves* lanceolate or oblanceolate, acute (or obtuse and mucronate in var. *obtusa*); entire; the base narrowed 3-nerved; upper surface glabrescent or glabrous; lateral nerves 5 or 6 pairs, not prominent; length 1·5 to 2 in., breadth ·4 to ·8 in., petiole ·2 to ·3 in. *Cymes* axillary, solitary, not much longer than the petioles, few-flowered. *Flowers* ·4 or ·5 in. long. *Calyx* densely stellate-tomentose externally, cylindric, the mouth slightly expanded, with 5 acute triangular teeth, 2-lipped. *Petals* longer than the calyx, linear-subspatulate, with 2 or 3 horned appendages below the middle. *Staminal column* shorter than the petals, narrowly cylindric and otherwise as in *H. Isora*, the stamens smaller. *Ovary* inserted near the apex of the staminal tube, sub-globular, ridged, tomentose. *Fruit* ovoid-cylindric, apiculate, not twisted, the carpels closely coherent, ·75 in. long and ·4 in. in diam., densely covered with stellate, villous soft prickles as in *H. hirsuta*. DC. Prodr. i. 476; Mast. in Hook. fil. Fl. Br. Ind. i. 365; Bl. Bijdr. 80; Pierre Fl. Forest. Coch-Chine, t. 210 and 211; Wall. Cat. 1180. *H. lanceolata*, DC. Prodr. i. 476; Pierre, l. c. 210 B. *H. virgata*, Wall. Cat. 1181. *Oudemansia integerrima*, Miq. Pl. Jungh. i. 296; Fl. Ind. Bat. i. pt. 2, 170. *Oud. Javensis*, Hassk. Retzia, i. 134. *Orthothecium Javense*, Hassk. Pl. Jav. Rar. 307.

Malayan Archipelago, China.

Var. *obtusa*, (species Wall. Cat. 1184); Pierre, l. c. 211 B, 14 to 25. Kurz in Journ. As. Soc. Beng. 1873, pt. ii. 62. *Leaves* obtuse, mucronate.

Perak; Nicobar Islands.

## 6. PTEROSPERMUM, Schreb.

Trees or shrubs, scaly or stellate-tomentose. *Leaves* usually bifarious, leathery, oblique, simple or lobed, penninerved. *Peduncles* 1-3, axillary and terminal. *Bracteoles* entire, laciniate, persistent or caducous. *Calyx* of 5 valvate, coriaceous, more or less connate, sepals. *Petals* 5, imbricate, membranous, deciduous with the calyx. *Staminal column* short, bearing opposite to the sepals 3 linear 2-celled anthers, and opposite to the petals 5 ligulate staminodes; cells parallel; connective apiculate. *Ovary* inserted within the top of the staminal column, 3-5 celled; style entire, stigma 5-furrowed; ovules many in each cell. *Capsule* woody or coriaceous, terete or angled, loculicidally 5-valved. *Seeds* winged above, attached in two rows to the inner angle of the cells of the capsule; albumen thin or 0; cotyledons plaited or corrugated,

radicle inferior. Distrib. A genus of about 18 species, confined to tropical Asia.

Flowers 6 in. long ... .. 1. *P. diversifolium*.

„ 2 in. long.

Sepals shortly pubescent inside,  
capsule 3 to 4 in. long.

2. *P. Blumeanum*.

Sepals with silky hairs inside;  
capsule 1.5 in. long, with scaly  
hairs ... ..

3. *P. Jackianum*.

„ less than 2 in. long; capsule 2 to  
2.5 in., glabrous ... ..

4. *P. aceroides*.

1. *P. DIVERSIFOLIUM*, Blume, Bijdr. 88. A tree 60 to 100 feet high: young branches, petioles, under surfaces of leaves and outer surface of sepals and fruit covered with a layer of minute, tawny tomentum with many, more or less deciduous, rufous, stellate hairs on its surface. *Leaves* coriaceous, varying from obovate-oblong to elliptic-rotund; the apex broad, blunt, or sub-truncate, suddenly contracted into a triangular point; the edges entire or sinuous, rarely lobed; the base always cordate or emarginate, 3 to 7-nerved and often oblique: upper surface shining, glabrous, except the tomentose midrib: main nerves 8 to 10 pairs, straight, sub-erect, prominent on both surfaces; length 6 to 9 in., breadth 3.5 to 6 in., petiole 1 to 1.25 or even 2 in., stipules small linear, caducous. *Flowers* 6 to 7 in. long, buds narrowly cylindric, solitary, or in 3 to 4-flowered sub-sessile axillary cymes; pedicels .2 in. long, each with a minute recurved lanceolate bracteole. *Sepals* coriaceous, slightly shorter than the petals, linear, blunt, adpressed-sericeous internally. *Petals* membranous, linear, glabrescent. *Staminal tube* and gynophore 2 in. long; the free part of the filaments slightly longer; fertile anthers about 10, linear; staminodes 5, pubescent. *Ovary* fusiform, tomentose, 5-celled. *Style* less than 2 in. long, angled, pubescent; stigma fusiform. *Capsule* woody, oblong, pointed, acutely 5-angled, suddenly constricted at the base, about 4 to 5 in. long and 1.5 to 2 in. in diam. *Seeds* flattened, 1.5 to 2 in. long. *Mast.* in Hook. fil. Fl. Br. Ind. i. 367; Pierre Fl. For. Coch.-Chine, t. 179; Miq. Fl. Ind. Bat. i. pt. 2, p. 192; Hassk. Pl. Jav. Rar. 316; Korth. Ned. Kruik. Arch. i. 312. *P. acerifolium*, Zoll. et Mor. Syst. Verz. p. 27 (excl. syn. Willd.)

Perak, Malacca; common; at low elevations. Distrib. Java, Philippines, Cochin-China.

The leaves on young shoots of this are often peltate and deeply lobed.

2. *P. BLUMEANUM*, Korth. Ned. Kruik. Arch. ii. p. 311. A tree

40 to 50 feet high: young branches slender, almost black when dry; when very young covered by deciduous furfuraceous rufous stellate hairs. *Leaves* thinly coriaceous, very inequilateral, oblong to ovate or lanceolate-oblong, entire, acuminate; the base broad, unequally cordate, one side auriculate or sub-auriculate; upper surface very dark when dry, glabrous, shining; the lower densely but minutely tawny or rufous-tomentose with many deciduous cinnamoneous stellate hairs on the surface; main nerves 5 to 7 pairs, prominent beneath; length 3 to 5·5 in., breadth 1·35 to 2 in.; petiole ·15 in.; stipules subulate-lanceolate. *Flowers* 2 in. long, solitary, or in 2-3-flowered cymes, axillary, or (by the suppression of the leaves) in terminal racemes: pedicels ·5 in. long, bracteate, cylindric in bud. *Sepals* coriaceous, narrowly linear, acute, scurfy, stellate-pubescent externally as are the pedicels and bracteoles, pubescent internally. *Petals* membranous, obliquely oblong-oblancoolate or sub-spathulate, shorter than the sepals, glabrescent. *Staminal tube* and gynophore about ·5 in. long, the free part of the filaments rather longer; fertile anthers about 10; staminodes 5, scaly-pubescent above. *Ovary* ovoid, villous, 5-celled. *Style* shorter than the staminal tube, glabrous: stigma narrowly ovoid. *Capsule* woody, oblong, 5-angled, sub-acute, gradually and slightly narrowed at the base, glabrous when ripe; 3 to 4 in. long and 1·5 in. in diam. *Seeds* flat, 1·5 in. long. Miq. Fl. Ind. Bat. i. pt. 2, p. 191. *Pterospermum lanceaefolium*, Bl. (not of Roxb.) Bijdr. 87. *P. cinnamoneum*, Kurz, For. Fl. Burm. i. 147. *P. Javanicum*, Jungh. Kurz, l. c. i. 147.

Perak, Penang; common at low elevations. Distrib. Sumatra, Java, Borneo, Burmah, Assam.

A very common tree in Perak. Korthal's Bornean species *P. fuscum* appears to me to be nothing more than a very cinnamoneous-tomentose form of this. And the Peninsular-Indian *P. rubiginosum*, Heyne, (Mast. in Hook. fil. Fl. Br. Ind. i. 368) cannot be very different. I should be induced to reduce both to the oldest described species which is this. Of the absolute identity of Kurz's *P. cinnamoneum* with this I have no doubt whatever.

3. *P. JACKIANUM*, Wall. Cat. 1164. A tree: the small branches slender, rather dark, when young covered by a layer of white minute tomentum with many rufous stellate hairs on its surface. *Leaves* sub-coriaceous oblong or elliptic-oblong, slightly inequilateral, entire, or sinuate towards the rather abruptly acuminate apex; the base sub-acute, or truncate and minutely cordate or emarginate, never apicled; upper surface pale brown when dry, glabrous except the puberulous midrib and nerves; under surface pale brown or buff, with

a layer of minute tomentum and on the surface (and especially on the midrib and nerves) many minute deciduous rusty stellate hairs; nerves 10 to 12 pairs, prominent beneath, spreading; length 4 to 5·5 in., breadth 1·5 to 2 in., petiole ·25 in.; stipules caducous. *Flowers* 2 in. long: the buds cylindric, acute, solitary, axillary; pedicels ·1 in. long, tomentose like the exterior of the sepals, minute, linear-subulate. *Sepals* linear-lanceolate, adpressed-sericeous within. *Petals* shorter than the sepals, oblanceolate, scaly, puberulous externally. *Staminal tube* and gynophore ·25 in. long, the free part of the filaments more than twice as long; fertile anthers about 12; staminodes 5. *Ovary* fusiform. *Style* longer than the stamens, pubescent below; stigma cylindric. *Capsule* (*vide Masters*) shortly stalked, ovoid, acute, 1·5 in. long and 1 in. in diam., covered with flat scaly hairs. *Must.* in Hook. fil. Fl. Br. Ind. i. 367; *P. oblongum*, Wall. Cat. 1165.

Penang; Jack, Wallich, Curtis. Malacca; Stolickza, at low elevations.

This species does not appear to be a common one. *P. Blumeanum* has probably been mistaken for it.

4. *P. ACEROIDES*, Wall. Cat. 1171. A tree 35 to 50 feet high: young branches rather slender, covered (as are the petioles and under surfaces of the leaves) by a thin felted layer of minute white tomentum, above which is a superficial deciduous layer of loose stellate rufous hairs. *Leaves* coriaceous, more or less elliptic, sometimes obovate-elliptic, the apex abruptly and shortly acuminate, the edge often straight at the sides, sometimes waved, never lobed: the base sub-truncate, often cordate, 5 to 7-nerved; upper surface (when adult) glabrous: main lateral nerves 12 to 15 pairs, straight, oblique; length 5 to 10 in., breadth 3·25 to 5·5 in., petiole ·4 to ·5 in. *Flowers* 1·5 to 1·75 in. long; solitary, or in 3 to 4-flowered sub-sessile axillary cymes; pedicels ·2 in. long, each with a deeply lobed tomentose bract; the buds narrowly cylindric, ribbed. *Sepals* very coriaceous, recurved, longer than the petals, linear, acute, scurfy-tomentose outside, adpressed-pubescent within. *Petals* membranous, obovate, glabrous in the inner, scurfy on the outer, surface. *Stamens* as long as the petals or shorter, the tube only ·25 in. long: fertile anthers about 15, linear. *Style* shorter than the stamens, glabrous; stigma clavate; ovary densely sericeous, 5-angled. *Capsule* woody, oblong, pointed at both ends, angled, glabrous, 2 to 2·5 in. long. *Kurz* in Journ. As. Soc. Beng. 1873, pt. 62; *For.* Flora Burm. i. 145. *P. acerifolium*, Mast. (not of Willd.) in Hook. fil. Fl. Br. Ind. i. 368, in part. *Miq.* Ill. Arch. Ind. 84, in part.

Andaman Islands; Helfer, No. 568 (Kew Distrib.), *Kurz*, King's Collectors. Distrib. Burmah; Wallich.

The nearest ally of this is no doubt *P. acerifolium*, Willd., to which it has been reduced by Dr. Masters. But (having had living trees of both under observation in the Botanic Garden, Calcutta, for many years) I have no hesitation in saying that the two species are quite distinct. *P. aceroides* has entire, not lobed, leaves; much smaller flowers (less than 2 in. long) which expand during December and January: while those of *P. acerifolium* measure '6 in. length and open in March or April. The capsule of *P. aceroides* is moreover only 2 to 2·5 in. long and quite glabrous; while that of *P. acerifolium* is 4 to 6 in. long, with a rough densely stellate tomentose exterior.

## 7. MELOCHIA, Linn.

Herbs or undershrubs, more or less downy. *Leaves* simple. *Flowers* small, clustered or loosely paniced. *Sepals* 5, connate below. *Petals* 5, spathulate, marcescent. *Stamens* 5, opposite to the petals, connate below into a tube; anthers extrorse, 2-lobed, lobes parallel. *Ovary* sessile, 5-celled; cells opposite the petals, 2-ovuled; styles 5, free or connate at the base. *Capsule* loculicidally 5-valved. *Seeds* ascending, albuminous; embryo straight, cotyledons flat, radicle next the hilum.—Distrib. Species about 50, natives of the warmer regions of both hemispheres.

1. *M. CORCHORIFOLIA*, Linn. sp. 944. A pubescent, branching herb or undershrub. *Leaves* membranous, variable, broadly ovate, to ovate-oblong or lanceolate, acute, serrate or obscurely lobed; the base rounded, truncate or sub-hastate, 5-nerved, often plaited; petiole from '4 to 1 in.; stipules linear, minute. *Flowers* '2 in. in diam., in crowded terminal or axillary heads with many villous bracteoles intermixed. *Sepals* lanceolate, acuminate, ascending. *Petals* obovate. *Ovary* villous; styles glabrous. *Capsule* pisiform, pubescent, exceeding the calyx. Willd. Sp. Pl. iii. 604; Roxb. Fl. Ind. iii. 139; Wall. Cat. 1196, in part; Mast. in Hook. Fl. Br. Ind. i. 374. *M. truncata*, Willd. Sp. Pl. iii. 601. *M. supina*, L. Sp. Pl. 944. *M. affinis*, Wall. Cat. 1198. *M. pauciflora*, Wall. Cat. 1199. *Riedleia corchorifolia*, DC. Prodr. i. 491; W. & A. Prodr. i. 66; Miq. Fl. Ind. Bat. i. pt. 2, 188. *R. truncata*, W. & A. l. c. 66. *R. supina*, DC. Prodr. i. 491. *R. concatenata*, DC. Prodr. i. 492. *Visenia corchorifolia*, Spreng. Syst. iii. 30. *V. concatenana*, Spreng. Syst. iii. 30. *V. supina*, Spreng. Syst. iii. 31. *Melochia concatenata*, Wall. Cat. 1197. *Sida cuneifolia*, Roxb. Hort. Beng. 50,

In all the provinces, a common weed. Distrib. The Tropics generally.



2. *M. VELUTINA*, Bedd. Fl. Sylvat. t. 5. A large shrub or small tree, all parts pubescent and with many of the hairs stellate. *Leaves* membranous, long-petioled, broadly ovate, acuminate, coarsely and irregularly serrate; the base 5 to 7-nerved, rounded or cordate; 4 to 9 in. long, by 3·5 to 8 in. broad: petioles 2·5 to 4·5 in.; stipules rounded 2·5 in. long. *Oymes* on peduncles longer than the petioles, much branched, spreading, many-flowered, terminal and axillary. *Flower* 2·5 in. in diam., pink. *Calyx* campanulate, with 5 deep broad abruptly acuminate teeth. *Petals* narrowly oblong, longer than the calyx, membranous. *Stamens* inserted on a hypogynous disk as are the petals filaments flat. *Ovary* villous, as are the lower parts of the styles. *Capsules* 3 to 5 in. long, ovoid-cylindric, apiculate, deeply 5-grooved bristly-tomentose. *Seed* solitary in each cell, its wing ascending. *Mast.* in Hook. fil. Fl. Br. Ind. i. 374; Kurz For. Fl. Burm. i. 148. *Visneria indica*, Houtt. Linn. Syst. vi. p. 287, t. 46; Miq. Fl. Ind. Bat. i. pt. 2, p. 189. *V. umbellata*, (Houtt.) Bl. Bijdr. 88; Wight Ic. 509. *V. Javanica*, Jungh. in Tijdsch. Nat. Gesch. viii. 302. *Glossospermum velutinum*, Wall. Cat. 1153. *G. ? cordatum*, Wall. Cat. 1155.

In all the Provinces at low elevations—a tree-weed appearing in abandoned fields. Distrib. Malayan Archipelago, British India, Mauritius.

#### 8. WALTHERIA, Linn.

Herbs or undershrubs. *Leaves* simple. *Stipules* linear. *Flowers* small, in dense axillary or terminal clusters. *Sepals* 5, connate below into a bell-shaped tube. *Petals* 5, oblong-spathulate. *Stamens* 5 tubular below; anthers 2-lobed, lobes parallel. *Staminodes* 0. *Ovary* sessile, 1-celled; 2-ovulate. *Styles* 2, distinct, clavate. *Capsule* 2-valved, 1-seeded. *Seeds* ascending, albuminous; embryo straight, cotyledons flat. Distrib. About 15 species, one or two of which are weeds in the Tropics generally; the others are Tropical S. American.

1. *W. INDICA*, Linn. sp. 941. A pubescent undershrub. *Leaves* ovate-oblong, obtuse, serrate or crenate, the base rounded or cordate; nerves 5 to 7 pairs, prominent beneath. *Flowers* 2·5 in. in diam., sessile; bracts linear. *Calyx* campanulate, villous, 10-nerved, the mouth with 5 acuminate teeth. *Petals* oblanceolate, clawed, longer than the calyx. *Capsule* membranous, pubescent. DC. Prod. i. 493; W. & A. Prod. i. 67; *Mast.* in Hook. fil. Fl. Br. Ind. i. 374; Miq. Fl. Ind. Bat. i. pt. 2, p. 187; Wall. Cat. 1194. *W. Americana*, L. DC. Prod. i. 492. *W. elliptica*, Cav. Diss. vi. 171; Wall. Cat. 1195.

In all the Provinces: a weed. Distrib. The Tropics generally.

9. *ABROMA*, Jacq.

Trees or shrubs. *Leaves* cordate, ovate-oblong, serrulate, sometimes angled. *Peduncles* opposite the leaves, few-flowered. *Sepals* 5, connate near the base. *Petals* 5, purplish, concave below, prolonged above into a large spoon-shaped lamina. *Staminal-cup* of 5 fertile and as many sterile divisions; fertile filaments opposite the petals, 3-antheriferous; anthers 2-lobed, lobes divergent. *Staminodes* longer than the fertile filaments, obtuse. *Ovary* sessile, pyramidal, 5-lobed; cells many-ovuled, styles 5. *Capsule* membranous, 5-angled, 5-winged, truncate at the apex, septicidally 5-valved, valves villous at the edges. *Seeds* numerous, albuminous; embryo straight, cotyledons flat, cordate, radicle next the hilum.—Distrib. 2 or 3 species, natives of Tropical Asia.

1. *A. AUGUSTA*, Linn. fil. Suppl. 341. A pubescent large shrub or small tree: young branches pale. *Leaves* 5 to 7-nerved at the base, 3·5 to 6 in. long and 3 to 5 in. broad; petiole 1·75 to 2·5 in., the upper much smaller and narrower. *Stipules* linear, deciduous. *Flowers* 2 in. in diam., peduncles 1·5 in., extra-axillary. *Sepals* 1 in. long, lanceolate, free to nearly the base. *Petals* longer than the sepals, imbricate, deciduous. *Capsule* 1·5 to 2 in. in diam., glabrous or nearly so when ripe. DC. Prod. i. 485; Mast. in Hook. Fl. Br. Ind. i. 375; Bl. Bijdr. 85; Roxb. Hort. Beng. 50; Fl. Ind. iii. 156; Miq. Fl. Ind. Bat. i. pt. 2, 183; Beddome Flor. Sylvat. Anal. Gen. t. 5; W. & A. Prodr. i. 65; Wall. Cat. 1142. *A. angulata*, Lam. Ill. 636. *A. Wheeleri*, Retz. Obs. v. 27; Willd. Sp. Pl. iii. 1425. *A. fastuosum*, Gært. Fruct. i. 307, t. 64.

In all the Provinces at low elevations: usually near cultivation. Distrib. Malayan Archipelago, Philippines, China, Brit. India.

The bark yields a stout fibre.

10. *BUETTNERIA*, Linn.

Erect climbing or tomentose shrubs, herbs, or trees; sometimes prickly. *Leaves* various. *Flowers* minute, in axillary or terminal much-branched, umbellate cymes. *Sepals* 5, slightly connate near the base. *Petals* 5, unguiculate, concave, inflexed, with 2 small lateral lobes, and a long sub-terminal simple linear or narrowly lanceolate appendage. *Staminal tube* with 5 broad truncate or emarginate teeth and, between them, five 2-celled extrorse anthers (mouth entire in *B. Curtisii*). *Ovary* sessile, 5-celled, the cells 2-ovulate. *Style* entire, 5-fid. *Capsule* globose, echinate, septicidally 5-valved, the cells 1-seeded. *Seed* ascending, exalbuminous: cotyledons folded round the radicle. Distrib. About 48 species, mostly tropical American: a few tropical Asiatic and one African.

Leaves longer than broad, their bases not cordate or only minutely so.

Staminal tube with entire mouth ... 1. *B. Curtisi*.

Staminal tube with its mouth 5-lobed.

Leaves quite glabrous.

Capsule less than 1 in. in diam., covered with glandular barbed spines ... 2. *B. uncinata*.

Capsule more than 1 in. in diam., covered with short subulate spines ... 3. *B. Maingayi*.

Leaves more or less minutely hispid on both surfaces ... 4. *B. elliptica*.

„ hispid on the upper, hispid-tomentose on the lower, surface ... 5. *B. Jackiana*.

Leaves about as broad as long, deeply cordate at the base.

Leaves glabrous, or glabrescent, not lobed ... 6. *B. aspera*.

„ sparsely pubescent, often lobed ... 7. *B. Andamanensis*.

1. *B. CURTISII*, Oliver in Hook. Ic. Pl. t. 1761. A slender woody creeper, 10 to 15 feet long: young branches minutely puberulous. *Leaves* linear-lanceolate or oblanceolate-oblong, rarely ovate-oblong, acuminate, entire, narrowed to the sub-obtuse, minutely cordate, 5-nerved base: lateral nerves numerous, unequal and spreading at various angles, reticulations distinct: both surfaces glabrous, the lower with tufts of stellate hairs in the axils of the leaves; length 2·5 to 7 in., breadth ·5 to 2 in.; petiole ·25 in., pubescent. *Cymes* in axillary fascicles of 2 to 4, slender, 3 to 7-flowered, puberulous; peduncles about 1 in. long: flower-pedicels ·25 in. *Flowers* ·45 in. in diam., buds conical. *Calyx* deeply 5-partite, the segments ovate-lanceolate, acuminate. *Petals* strap-shaped with 2 rather broad inflexed lateral lobes, and a long cylindric curved sub-terminal appendage, about as long as the sepals. *Capsule* globular, about 1 in. in diam., veined, pubescent, and armed with numerous straight smooth bristles.

Penang, Curtis, Nos. 817 and 1166; Perak, common at low elevations.

This is closely allied to the Bornean *B. lancifolia*, Hook. fil. The leaves vary a good deal in shape, the most prevalent form in the Perak

specimens being linear-lanceolate. The Penang specimens are, on the other hand, as figured by Professor Oliver, oval-oblong.

2. *B. UNCINATA*, Mast. in Hook. fil. Fl. Br. Ind. i. 377. A woody climber: young branches at first scurfy and hispid, but very soon glabrous. *Leaves* sub-coriaceous, elliptic-oblong; gradually tapering in the upper third to the acuminate apex, entire, the base slightly cuneate, 3-nerved; both surfaces glabrous and shining, nerves 9 or 10 pairs, spreading, thin but prominent beneath: length 9 to 11 in., breadth 3 in., petiole nearly 3 in., thickened at the apex, glabrous. *Sepals* lanceolate, spreading, hispid. *Fruiting peduncles* (fide Masters) "half the length of the leaves. *Capsule* depressed-spheroidal, the size of a hazelnut, covered with hooked gland-tipped barbed hispid spines, 3-celled."

Malacca, Maingay, No. 242 (Kew Distrib.).

I have seen only Maingay's Malacca specimens.

3. *B. MAINGAYI*, Mast. in Hook. fil. Fl. Br. Ind. i. 377. A woody climber: young branches glabrous. *Leaves* sub-coriaceous, elliptic to elliptic-oblong, shortly bluntly and rather abruptly acuminate, entire; the base rounded with 3 bold and 2 minute nerves: both surfaces quite glabrous; lateral nerves about 2 or 3 pairs, prominent beneath as are the reticulations; length 7 or 8 in., breadth 3 to 3·5 in.; petioles 1·2 in., thickened towards the apex, glabrous. *Umbels* in axillary fascicles of 6 or 8, their peduncles about 1 in. long, slender, glabrescent; pedicels ·25 in. *Sepals* ·25 in. long, ovate-lanceolate. "*Petals* shorter than the sepals, with a long linear appendage. *Staminodes* erect, oblong, obtuse, bifid. *Style* as long as the ovary. *Fruiting peduncle* as long as the petiole. *Capsule* globose, 1·25 in. in diam., obscurely 5-lobed, studded with short subulate prickles."

Malacca; Griffith, Maingay.

Of this species I have seen no good specimens in flower or fruit, and the above account of these parts is taken from Masters' description.

4. *B. ELLIPTICA*, Mast. in Hook. fil. Fl. Br. Ind. i. 377. A woody climber; young branches minutely rusty-tomentose. *Leaves* broadly elliptic, abruptly and shortly acuminate, entire; the base 5-nerved, rounded or minutely cordate; upper surface minutely scabrid-hispid, the midrib and nerves hispid-tomentose; lower minutely pubescent on the veins, the midrib and longer nerves tomentose: lateral nerves 3 pairs, oblique, curving, prominent beneath as are the secondary nerves and reticulations: length 5·5 to 7·7 in., breadth 3·5 to 4·75 in., petiole

2 to 3 in., tomentose. *Umbels* pedunculate, solitary or in fascicles of 5 or 6, axillary, few-flowered, stellate-tomentose: peduncles .5 to 1 in.; pedicels .1 to .25 in., both slender. Buds .1 in. in diam. *Sepals* ovate, acute. *Petals* rounded, with long cylindric inflexed apices longer than the sepals. *Fruit* unknown.

Malacca, Maingay: No. 241 (Kew Distrib.). Perak; Scortechini.

Evidently a rare species; for I have seen, besides Maingay's, only Scortechini's solitary specimen.

5. *B. JACKIANA*, Wall. in Roxb. Fl. Ind. (ed Carey) ii. 386. A stout woody creeper, the young branches with densely minute ferruginous tomentum some of which is stellate. *Leaves* narrowly or broadly elliptic, acuminate, entire; the base boldly 3-nerved, rounded, sometimes slightly cordate, rarely acute; upper surface sparsely and shortly hispid; under surface rufous, hispid-tomentose especially on midrib and nerves, many of the hairs on both surfaces stellate; lateral nerves 3 or 4 pairs, curved, spreading; length 3.5 to 6 in., breadth 2 to 3.75 in.; petiole .4 to 1 in. tomentose. *Umbels* pedunculate, solitary or in groups of 3 or 4 from the leaf-axils, few-flowered, tomentose: peduncles .25 to 1 in. long; pedicels about .35, slender. *Sepals* linear-subulate, spreading, hispid, about .4 in. long. *Petals* sub-rotund, lobed, each with a single long cylindric terminal appendage as long as the sepals. *Capsule* globose, slightly 5-furrowed, 1 in. in diam., black, glabrescent, armed with many straight spines. *Seeds* oblong, black. Mast. in Hook. fil. Fl. Br. Ind. i. 376; Wall. Cat. 1147.

Penang, Perak and Singapore; at low elevations.

6. *B. ASPERA*, Colebr. in Roxb. Fl. Ind. (ed. Carey), ii. 383. A powerful woody climber often with a tree-like stem; young branches glaucous, minutely and deciduously pubescent. *Leaves* sub-orbicular or ovate-orbicular, shortly acuminate, entire, the base cordate, 5 to 7-nerved; upper surface glabrous, shining; the lower glabrescent, the midrib and nerves puberulous; lateral nerves 4 to 6 pairs, prominent beneath as are the stout transverse veins; length 4.5 to 7.5 in., breadth about the same: petiole 2 to 5 in., glaucous-pubescent at first, afterwards glabrous. *Cymes* axillary, solitary or fasciculate, pedunculate, much branched, many-flowered, pubescent to tomentose, 3 or 4 in. long: ultimate pedicels .5 in. long, slender. *Sepals* lanceolate, acute, spreading, .15 in. long, puberulous externally. *Petals* cuneate, shorter than the sepals, 3-lobed, the middle lobe linear-lanceolate, reflexed. *Staminodes* truncate. *Ovary* globular, scabrid. *Capsules* globular, 1.5 to 2 in. in diam., slightly depressed, pubescent when young, glabrous when ripe,

armed with many long, nearly straight, sharp spines. *Seeds* oblong, .5 in. or more long. Wall Cat. 1144; Mast. in Hook. fl. Fl. Br. Ind. i. 377; Kurz For. Fl. Burm. i. 151; Pierre Fl. Forest. Coch-Chine, t. 206, figs. 1 to 8. *B. grandifolia*, DC. Prodr. i. 486. *B. nepalensis*, Turcz. in Bull. Mosc, 1858, 207.

Andaman Islands. Distrib. Brit. India, China, Cochin-China.

7. *B. ANDAMANENSIS*, Kurz in Journ. As. Soc. Bengal, 1871, ii. 47. A woody climber: young branches scaberulous. *Leaves* sub-orbicular, crenate and palmately 3 to 5-lobed, the lobes acuminate; or ovate-rotund, acuminate and irregularly serrate-crenate and not lobed; the base always deeply cordate, 5 to 7-nerved; lateral nerves about 5 pairs, opposite, prominent beneath as are the midrib and straight transverse veins; both surfaces sparsely pubescent at first, but afterwards glabrous. *Cymes* umbellate, 2 or 3 times branched, spreading, many-flowered, solitary, or 2 or 3 in a fascicle, axillary: the common peduncle stout, .6 to .75 in. long; secondary peduncles about the same length, tertiary half as long: flower-pedicels .15 in., all slender and slightly pubescent. *Sepals* ovate acuminate or deltoid, puberulous externally. *Petals* with 2 obscure lateral lobes, and a long lanceolate inflexed middle lobe. *Staminodes* truncate. *Capsule* globose, less than 1 in. in diam, glaucous when young, armed with a few unequal, rather short, smooth, stiff spines. Kurz in Flora, 1871, p. 277; For. Fl. Br. Burm. i. 152; Mast. in Hook. fl. Fl. Br. Ind. i. 377; Pierre Fl. Forest. Coch-Chine, t. 207, figs. 1 to 9..

Andaman Islands. Distrib. Burmah, Siam, Cochin-China.

# 11. *COMMERSONIA*, Forsk.

Trees or shrubs. *Leaves* simple, oblique. *Inflorescence* cymose, terminal or axillary or leaf opposed. *Calyx* 5-cleft. *Petals* 5, concave at the base, prolonged into a long strap-shaped appendage at the apex. *Fertile stamens* 5, opposite the petals; anthers subglobose, 2-celled, cells diverging; staminodes 5, opposite to the sepals, lanceolate. *Carpels* 5, opposite to the sepals, connate; *styles* connate; *ovules* 2-6. *Capsule* loculicidally 5-valved, covered with bristly hairs. *Seeds* ascending, albuminous, strophiolate; cotyledons flat, radicle next the hilum. Distrib. A genus of about 8 species, some of which are natives of the Malay peninsula and Archipelago, others of Australia.

*C. PLATYPHYLLA*, Andr. Bot. Rep. t. 603 (note). A low tree; young branches softly rusty-tomentose. *Leaves* membranous, inequilateral, ovate-acuminate, irregularly dentate-serrate; the base more or less cordate, one side sub-auriculate, upper surface sparsely and minutely

stellate-hairy, lower softly hoary tomentose: length 5 to 8 in., breadth 3 to 4·5 in., petioles 2 to 3 in.; stipules shorter than the petioles, scarious, lobed. *Cymes* corymbose, much shorter than the leaves, spreading, much branched, tomentose. *Flowers* 2 or 2·5 in. in diam. *Calyx* pubescent, cut nearly to the base into 5 ovate-lanceolate lobes. *Petals*, as long as the sepals but much narrower, concave at the base; the terminal appendage elongate, narrowly oblong, its edges inflexed. *Stamens* 5, the anthers broad, extrorse. *Staminodes* 5, lanceolate, spreading, reflexed, shorter than the petals. *Ovary* 5-celled. *Capsule* globose, 4 or 5 in. in diam., densely covered with long soft, flexuose, pubescent bristles. Mast. in Hook. fil. Fl. Br. Ind. i. 378. *O. Javensis*, G. Don. Gen. Syst. i. 523; Hassk. Pl. Jav. Rar. 312. *O. echinata*, Blume Bijdr. 86; Wall. Cat. 1143; Andr. Bot. Rep. t. 519, not of Forst. *O. echinata*, var.  $\beta$ . Miq. Fl. Ind. Bat. i. pt. 2, 182. *Buettneria hypoleuca*, Turcz. in Mosc. Bull. 1858, 207.

In all the provinces except the Andamans and Nicobars. Distrib. Malayan Archipelago, Philippines.

## 12. LEPTONYCHIA, Turcz.

Shrubs or trees. *Leaves* simple, entire. *Flowers* in small axillary cymes. *Sepals* 5, valvate, united near the base. *Petals* 5, valvate, short, orbicular, concave. *Andræcium* tubular below, filamentiferous above, filaments 3-soriolate, outer series of 5 to 10 ligulate staminodes opposite the petals, middle of 10 fertile stamens also opposite the petals, innermost of 5 very short fleshy subulate staminodes opposite the sepals; anthers linear-oblong, introrse, dehiscent at the sides longitudinally. *Ovary* sessile, 3-4-celled; placentas axile; styles connate, stigmas capitellate; ovules many in each cell, anatropous. *Capsule* 2-3-celled, or by abortion 1-celled, dehiscent septicidally or loculicidally, or both simultaneously or irregularly. *Seeds* black, with a fleshy yellowish arillus; albumen fleshy, cotyledons foliaceous, radicle superior. Distrib. three or four species—Indo Malayan and Tropical African.

L. GLABRA, Turcz. in Mosc. Bull. for 1858, p. 222. A tree: the young branches glabrous. *Leaves* ovate-oblong or oblong-lanceolate, rather abruptly acuminate, the base slightly narrowed or rounded, 3-nerved; both surfaces glabrous, shining; main nerves 4 to 7 pairs, thin: length 4 to 8 in., breadth 1·6 to 3 in.; petiole 4 to 5 in., glabrous. *Flowers* 2·5 in. in diam.; the buds oblong, obtuse, 5-ridged. *Sepals* ovate-lanceolate or oblong, rather obtuse, spreading, pubescent on both surfaces, not veined. *Petals* about one-fourth the size of the sepals, broad, truncate, villous. *Stamens* 10, in five phalanges of two each,

nearly as long as the sepals. *Staminodes* 10 to 20, glabrous, the outer 5 to 15 shorter than, or as long as, the stamens, filiform; the inner invariably 5, short, subulate, internal to, and alternating with, the phalanges of stamens. *Ovary* broadly obovate, obtuse, obscurely 4-grooved, with a few scattered hairs near the apex, 4-celled. *Style* cylindric, tapering, with sparse spreading hairs. *Capsule* coriaceous, depressed-obovoid, pale greyish, '5 in. long, rugose; within shining pale and wrinkled. *Seed* solitary, oblong, black, less than half covered by a thin arillus proceeding from its side. Mast. in Hook. fil. Fl. Br. Ind.  $\pm$  379; Kurz For. Fl. Burm. i. 150; Oudem. in Compt. Rend. Ac. Roy. Sc. Amsterd. 2 Ser., 11, 8, cum ic; Walp. Ann. vii. 449. *Grewia*? *caulata*, Wall. Cat. 1099. *L. heteroclita*, Kurz For. Fl. Burm. i. 150. *G. heteroclita*, Roxb. Fl. Ind. ii. 590. *Binnindykia trichostylis*, Kurz in Nat. Tijds. Ned. Ind., Ser. 3, iii. 164. *Turraea trichostylis*, Miq. Fl. Ind. Bat. Suppl. 502.

Malacca, Penang, Perak, Andamans; at low elevations. Distrib. Malayan Archipelago, Burma.

Var. *Mastersiana*, young branches, midribs and petioles of leaves puberulous; flowers '5 in. in diam., the buds pointed; sepals 3-veined: outer staminodes varying from 5 to 15, often pubescent in the upper half: ovary oblong-ovoid, villous, 3-celled: style glabrous: capsule black. *L. acuminata*, Mast. in Hook. fil. Fl. Br. Ind. i. 379.

Malacca and Perak. Distrib. Sumatra, Borneo, Burmah.

This shrub or small tree is common, and I have thus had the advantage of being able to examine a large number of flowers. The result of my examination of these is that, whereas the inner staminodes are invariably 5 in number, the outer series varies in number in the most perplexing way from 5 to 15. Where there are 10, they are always arranged in pairs united at the base: and where there are 15, they are arranged in threes united at the base. The proper view to take of these staminodes is I believe therefore that they are single organs, but sometimes deeply cleft into 2 or 3 linear and equal segments. On this account, and also on account of the similarity of the other organs, I am induced to think that there is but *one* species of *Leptonychia* and that Masters' species *acuminata* and Beddome's *L. moacurroides* are merely forms of the species on which Turczaninow originally founded the genus.

## ORDER XIX. TILIACEÆ.

Trees, shrubs or herbs. *Leaves* alternate, rarely opposite, simple or lobed. *Stipules* free, usually caducous. *Flowers* usually cymose, or in cymose panicles, or racemose. *Flowers* regular, hermaphrodite, rarely unisexual. *Sepals* 3-5, free or connate, valvate. *Petals* as many as the sepals, rarely absent, imbricate or valvate. *Stamens* numerous, rarely



definite, usually springing from a prolonged or dilated torus, free or sometimes 5-adelphous, filaments filiform; anthers 2-celled. *Ovary* free, 2-10-celled; styles columnar, or divided into as many divisions as there are cells to the ovary, stigmas usually distinct, rarely confluent or sessile. *Ovules* attached to the inner angle of the cells of the ovary; if few in number, often pendulous from the apex or ascending from the base; if more numerous, disposed in 2 or more ranks, anatropous; raphe ventral or lateral. *Fruit* fleshy or dry, dehiscent or indehiscent, 2-10 or by abortion 1-celled (cells sometimes divided by false partitions); carpels separable or always united. *Seeds* 1 or many, ascending, pendulous or transverse, with no arillus; testa leathery or crustaceous or pilose; albumen fleshy, abundant or scanty, rarely wanting; embryo straight or slightly curved, cotyledons leafy, rarely fleshy, radicle next the hilum.—Distrib. about 370 species; most abundant in the tropics of either hemisphere.

Series A. *Holopetalæ*. *Petals* glabrous or rarely downy, coloured, thin, unguiculate, entire or nearly so, imbricate or twisted in the bud. *Anthers* globose or oblong, opening by slits.

Tribe I. *Brownlowiæ*. *Sepals* combined below into a cup. *Anthers* globose, cells ultimately confluent at the top.

\* *Staminodes* 5.

Carpels distinct, 2-valved ... 1. *Brownlowia*.

Carpels combined, indehiscent, winged ... 2. *Pentace*.

\*\* *Staminodes* 0.

Stamens on a raised torus ... 3. *Schoutenia*.

Stamens on a contracted torus ... 4. *Berrya*.

Tribe II. *Grewiæ*. *Sepals* distinct. *Petals* glandular at the base. *Stamens* springing from the apex of a raised torus.

Fruit drupaceous, not prickly ... 5. *Grewia*.

Fruit dry indehiscent or 3-5 coccous, prickly 6. *Triumfetta*.

Tribe III. *Tiliæ*. *Sepals* distinct: petals not glandular. *Stamens* springing from a contracted torus.

Herbs or undershrubs with 3 or 5-celled capsules: seeds without hairs ... 7. *Corchorus*.

Trees with 2-celled capsules; seeds with marginal hairs ... 8. *Trichospermum*.

Series B. *Heteropetalæ*. *Petals* usually incised, rarely entire or absent, induplicate or imbricate not twisted: anthers linear, opening by a terminal pore often with an apical awn or tuft of hairs.

Stamens on a raised torus; fruit drupaceous 9. *Elæocarpus*.

## 1. BROWNLOWIA, Roxb.

Trees. *Pubescence* stellate or scaly. *Leaves* entire, 3-5-nerved, feather-veined. *Flowers* numerous, small, in large terminal or axillary panicles. *Calyx* bell-shaped, irregularly 3-5-fid. *Petals* 5, without glands. *Stamens* many, free, springing from a raised torus. *Staminodes* 5, within the stamens, opposite the petals and petaloid. *Anthers* subglobose. *Ovaries* 5, each 2-ovulate; styles awl-shaped, slightly coherent; ovules ascending. *Carpels* ultimately free, 2-valved, 1-seeded. *Albumen* 0; cotyledons thick, fleshy.—Distrib. Nine species confined to Tropical Asia.

*Leaves* not peltate.

Leaves lanceolate ... 1. *B. lanceolata*.

„ broadly elliptic to elliptic-rotund 2. *B. Kleinhovioidea*.

*Leaves* peltate.

Leaves minutely hairy beneath ... 3. *B. Scortechinii*.

„ glabrous on both surfaces ... 4. *B. macrophylla*.

1. BROWNLOWIA LANCEOLATA, Benth. in Journ. Linn. Soc. V. Suppl. ii. 57. A tree 25 to 30 feet high; young branches pale when dry, sub-lepidote. *Leaves* thinly coriaceous, lanceolate or oblong-lanceolate, acuminate, the base obtuse; upper surface when adult glabrous, shining, the lower covered by a dense layer of minute whitish yellow shining scales: main nerves 6 to 8 pairs (1 pair of them basal), not prominent: length 4·5 to 6 in., breadth 1·5 to 1·75 in., petiole ·25 to ·4 in. *Panicles* axillary or terminal, 1 to 3 in. long, and less than 1 in. across, few-flowered. *Flowers* ·25 in. long, their pedicels about as long. *Calyx* ·2 in. long, scaly like the pedicel, its lobes lanceolate. *Petals* longer than the calyx, oblong, blunt, slightly narrowed to the shortly unguiculate base, glabrous. *Anther-cells* sub-divaricate, sub-confluent when adult. *Ovary* deeply 3 to 5-lobed, pubescent, the cells 2-ovuled. *Ripe carpels* distinct, sub-globose, truncate, compressed on their inner surfaces, minutely lepidote and pubescent, ·5 in. in diam. *Seed* solitary, with thin testa and large sub-hemispheric cotyledons. Hook. fil. Fl. Br. Ind. i. 381: Kurz For. Flora Burm. 154.

Malacca, Griffith. Distrib. Burmah and Bengal; in tidal forests and mangrove swamps.

The young parts are covered with rusty or pale brown scales, but the adult branchlets leaves and flowers are as above described.

2. BROWNLOWIA KLEINHIOVIOIDEA, King, n. sp. A tree 40 to 50 feet high: young branches rather slender, covered with a dense thin layer of

minute pale brown hair. *Leaves* thinly coriaceous, broadly elliptic to elliptic-rotund, slightly narrowed to the obtuse apex, very little narrowed to the more or less cordate base: upper surface glabrous, very sparsely lepidote, the lower covered with a thin layer of very minute pale hair; basal nerves 4 or 6 (two of them small): main lateral nerves 3 pairs; transverse secondary nerves distinct: length 5 to 7 in., breadth 3.5 to 4.5 in.; petiole 2.5 to 3 in., thickened towards the apex, pubescent like the under surfaces of the leaves. *Panicles* mostly terminal, rarely axillary, 9 to 15 in. long (the axillary ones much smaller) the branches rather few, spreading little, the flowers rather closely clustered on the branchlets. *Flowers* .25 in. long, on pedicels about half as long. *Calyx* widely campanulate, cut for a third of its length into 5 acute triangular teeth, minutely tomentose externally, glabrous inside. *Petals* longer than the calyx, oblong, very obtuse, slightly narrowed but thickened towards the rather long basal claw. *Staminodes* linear, flat, about as long as the filaments. *Ovaries* 3 to 5, sub-globose, laterally compressed, pubescent. *Styles* subulate, a little longer than the stamens, slightly coherent. *Fruit* unknown.

On Gunong Babu in Perak, at elevations of 600 to 1000 feet; King's Collector.

A species with leaves not unlike those of *Kleinhovia hospita*: in many respects closely allied to *B. elata*, but with much smaller flowers.

3. *BROWNLAWIA SCORTECHNII*, n. sp., King. A small slender tree: young branches stout, pale, sparsely lenticellate, pubescent at first but soon glabrous. *Leaves* coriaceous, ovate-elliptic, peltate, slightly narrowed to the acute or sub-acute apex; the edges sub-undulate; very little narrowed to the rounded, or sometimes sub-emarginate, base; upper surface glabrous; the lower pale from a thin continuous layer of very minute hairs; petiole attached 2.5 to 3 in. above the base, nerves radiating from it about 9, lateral nerves from the midrib about 4 pairs; all rather prominent beneath, as are the transverse secondary nerves: length 10 to 15 in., breadth 5.5 to 7 in., petiole 7 to 9 in. long, thickened at both ends. *Panicle* terminal, 6 to 12 in. long and about 6 in. broad, or sometimes small narrow panicles in terminal clusters of 6 to 10: branches spreading, compressed, puberulous; bracteoles ovate, fugaceous; pedicels, stout, .15 in. long in the bud but lengthening as the flower expands, puberulous. *Flowers* .6 in. long, crowded. *Calyx* narrowly campanulate; its teeth half as long as the tube, lanceolate, sub-acute, tomentose-lepidote externally. *Petals* longer than the calyx, narrowly ob-ovate, much narrowed to the clawed base. *Staminodes* linear, about as long as the filaments. *Ovaries* 5, ovoid, compressed, stellate-pubescent.

*Styles* slightly longer than the stamens, subulate, bent at the apex.  
*Fruit* unknown.

Perak; Scortechini, No. 1918.

Collected only once by the late Fr. Scortechini and referred by him to *B. elata*, Roxb. The species is, however, quite distinct from *B. elata*; and also from *B. peltata*, which it more resembles in its leaves.

4. *BROWNLOWIA MACROPHYLLA*, King n. sp. A tree 30 to 40 feet high: young branches very stout, deciduously rufous-puberulous. *Leaves* very coriaceous, rotund, those on the older branches elliptic, the apex rounded or very slightly and shortly apiculate, the edges subundulate, the base broad, emarginate or slightly cordate, both surfaces glabrous; main nerves 7 to 9 basal and about 2 pairs lateral, prominent on both surfaces, secondary nerves transverse and very distinct: length of the rotund leaves 11 to 17 in., breadth 10 to 14: of the elliptic, length 6 to 10 in., breadth 3·5 to 5·5 in.: petiole 2·25 to 4·5 in., thickened at both ends. *Panicle* terminal, almost as long as the leaves, its branches numerous, compressed, grooved, spreading, scurfy and rusty-pubescent: bracts few, linear-lanceolate, nearly 1 in. long, persistent. *Flowers* 65 in. long: their peduncles shorter than the calyx, stout, deeply grooved. *Calyx* rather widely cylindric-campanulate, its teeth about half as long as the tube, acute, triangular, rusty-tomentose and scurfy externally. *Petals* oblong, obtuse, very little narrowed to the base and without any very distinct claw. *Ovaries* 3 to 5, narrowly ovoid, compressed, vertically ridged, lepidote as are the conjoined styles. *Fruit* sub-globose, much compressed, covered with a layer of very minute pale hairs, 75 in. in diam.

Perak, at low elevations and in moist ground; Scortechini, Wray, King's Collector.

## 2 PENTACE, Hassk.

Trees. Herbaceous portions sometimes pubescent or scaly, ultimately glabrous. *Leaves* entire, leathery, the lower surface (except in one species) pale from a thin layer of minute adpressed scaly hair. *Flowers* numerous, small, in terminal panicles. *Calyx* bell-shaped, usually 5-fid. *Petals* 5, membranous, glabrous, longer than the calyx, glandless. *Stamens* numerous, on a slightly raised torus, usually pentadelphous. *Staminodes* 5, opposite the sepals. *Anthers* subglobose; pollen globose, 3-pored. *Ovary* 5-celled, cells 2-ovuled; ovule pendulous, raphe next the placenta. *Styles* united, rarely free. *Fruit* dry, indehiscent, 3-10-winged, 1-celled, 1-seeded by abortion. *Seed* solitary, albuminous.—Distrib. About 15 species, all Malayan.

Leaves with pinnate nervation.

Ovary 3-ridged... 1. *P. triptera*.

Ovary 5-ridged.

Leaves with 6 or 7 pairs of nerves... 2. *P. Hookeriana*.

" " 3 or 4 " ... 3. *P. Kunstleri*.

\* Ovary 10-ridged ... 4. *P. perakensis*.

Leaves boldly 5-nerved at the base, lateral nerves from the central nerve (midrib)

3 pairs; 7 to 14 in. long; ovary 5-ridged... 5. *P. macrophylla*.

Leaves boldly 8-nerved at the base; the central nerve (midrib) with 1 or 2 pairs of lateral nerves: rarely more than 7 in. long.

Ovary not visibly ridged ... 6. *P. floribunda*.

Ovary 8 or 9-ridged.

Styles quite confluent ... 7. *P. Curtisii*.

" free... 8. *P. eximia*.

Ovary 10-ridged.

Leaves glabrous on both surfaces ... 9. *P. Scortechinii*.

" with a dense layer of minute adpressed hair on the under surface ... 10. *P. Griffithii*.

Leaves boldly 3-nerved at the base, the central nerve (midrib) without lateral nerves, only 3 or 4 in. long; ovary 5-ridged 11. *P. strychnoidea*.

1. PENTACE TRIPTERA, Mast. in Hook. fil. Fl. Br. Ind. i. 382. A large tree: young branches pubescent, speedily becoming glabrous, their bark dark-coloured. Leaves ovate to ovate-rotund, sometimes ovate-oblong, sub-acute or shortly and bluntly acuminate, the margins undulate, the base rounded; upper surface glabrous, the lower pale, minutely scaly; basal nerves one or two pairs; lateral 5 to 7 pairs, ascending, straight; length 4 to 5 in., breadth 2 to 2·75 in.; petiole ·6 to 1·2 in. thickened towards the apex, pubescent. Panicles terminal and axillary, 6 to 8 in. long, with short many-flowered branches minutely and softly stellate-tomentose. Flowers nearly ·2 in. long, on pedicels shorter than the calyx. Calyx with 5 lanceolate teeth, tomentose outside. Petals spathulate-oblong, obtuse. Stamens 5-delphous, longer than the style. Staminodes subulate, shorter than the stamens. Ovary densely tomentose, shortly 3-winged. Style filiform, glabrous, bent at the apex. Fruit oblong, narrow, ·6 in. long, with 3 spreading membranous rounded wings ·5 in. broad.

Malacca ; Griffith, Maingay. Perak : Scortechini.

This approaches the Javan *P. polyantha*, Hassk., which has, however, larger flowers with a shallower calyx with longer teeth, a shorter style, and a 5-lobed ovary.

2. *PENTACE HOOKERIANA*, n. sp., King. A tree 30 to 40 feet high : young branches cinereous, glabrous. *Leaves* elliptic-oblong, slightly obovate, acute, the base narrowed and slightly unequal ; upper surface glabrous, the lower dull ; lateral main nerves about 6 pairs (one of the pairs basal), prominent on both surfaces ; the intermediate nerves, transverse veins and reticulations prominent only on the lower : length 5 to 7.5 in. ; breadth 2 to 2.75 in. ; petiole .25 in., stout. *Panicles* terminal and in the axils of the upper leaves, 2.5 to 5 in. long, the branches spreading, everywhere scurfy-tomentose. *Flowers* rather crowded, .2 in. long, on pedicels shorter than the calyx. *Calyx* campanulate, cut half-way down into 3 or 4 broadly triangular sub-acute spreading teeth, scaly and minutely tomentose outside. *Petals* narrowly obovate. *Stamens* 15 in 5 bundles of 3 each, very much shorter than the petals. *Staminodes* thick, orbicular, embracing the ovary. *Ovary* depressed-globose, densely pubescent, obscurely 5-lobed, 5-celled. *Styles* 5, free, shorter than the ovary. *Fruit* unknown.

Perak, on the banks of the Kinta river : King's Collector, No. 815.

3. *PENTACE KUNSTLERI*, n. sp., King. A tree 30 to 40 feet high : young branches slender, dark-coloured, glabrous. *Leaves* broadly ovate, with an abrupt short broad blunt acumen, the base rounded : upper surface shining, glabrous, the lower dull ; lateral nerves 3 or 4 pairs, curved, prominent beneath ; sometimes a pair of short slender sub-marginal nerves at the base : length 4.5 to 6 in., breadth 2.5 to 3.5 in. ; petiole .75 to 1 in., stout, thickened at the apex. *Panicles* terminal, 3.5 to 6 in. long, puberulous, much-branched. *Flowers* numerous, .15 in. long, the pedicels slightly shorter. *Calyx* tubular-campanulate, minutely stellate-hairy and lepidote outside ; the teeth triangular, acute, erect. *Petals* spathulate with a very long claw. *Stamens* in 5 bundles. *Staminodes* linear-lanceolate, as long as the filaments. *Ovary* depressed-globose, with 5 blunt angles, lepidote and pubescent, 5-celled. *Style* straight, glabrous. *Fruit* unknown.

Perak, at a very low elevation ; King's Collector, No. 6871.

4. *PENTACE PERAKENSIS*, n. sp., King. A tree 30 to 40 feet high : young branches cinereous, glabrous. *Leaves* ovate-elliptic, slightly oblique, bluntly acuminate, the base rounded or sub-cuneate : upper surface shining, glabrous : the lower dull ; lateral nerves about 5 pairs,

ascending, curved; length 5 to 6 in., breadth 2·5 to 3 in.; petiole ·75 to 1 in., stout, and thickened at the apex. *Panicles* terminal, 4 to 5 in. long and less than 2 in. wide, little branched and few-flowered. *Flowers* about ·1 in. long, their pedicels about as long. *Calyx* rotate, minutely lepidote outside; the teeth triangular, spreading. *Petals* ovate, narrowed to a short claw. *Stamens* about 30, 5-delphous. *Staminodes* lanceolate, as long as the filaments. *Ovary* globose, slightly pointed, 10-ridged, slightly hairy, 5-celled. *Style* about as long as the ovary, cylindric. *Stigma* terminal, small. *Fruit* unknown.

Perak, King's Collector, No. 3428.

5. *PENTACE MACROPHYLLA*, n. sp., King. A tree usually from 20 to 30 feet high, but occasionally as much as 50 feet. Young branches rather slender, pale brown, glabrous. *Leaves* large, ovate-elliptic to almost rotund, the apex very shortly and abruptly blunt-acuminate, the base rounded: upper surface glabrous; the lower dull; basal nerves 2 pairs, the upper branched on one side; lateral nerves from the midrib 2 to 3 pairs, all ascending and little curved, prominent beneath; length 7 to 14 in., breadth 5 to 12 in.; petiole 2·5 to 3 in., stout. *Panicles* terminal and axillary, 6 to 15 in. long, lax, spreading, minutely yellowish-pubescent and scurfy. *Flowers* ·15 in. long and ·2 in. in diam., on pedicels about as long as the calyx. *Calyx* almost rotate, cut for two-thirds of its length into 5 lanceolate acute teeth, minutely yellowish-tomentose outside. *Petals* oblanceolate, obtuse. *Staminodes* linear, as long as the stamens. *Stamens* in 5 bundles of about 15 each. *Ovary* ovoid, scaly and pubescent, obtusely 5-angled. *Style* rather shorter than the stamens, cylindric, pointed. *Fruit* ·75 in. long with 10 radiating semi-elliptic striate sparsely scaly wings each ·4 in. wide.

Perak at elevations up to 500 feet; King's Collector, Scortechini, Wray: common.

Distinguished from all the other known species by the large size of its leaves.

6. *PENTACE FLORIBUNDA*, n. sp., King. A tree 40 to 70 feet high: young branches slender, sparsely stellate-puberulous, the bark dark-coloured. *Leaves* elliptic-oblong to elliptic-rotund, the apex shortly and rather abruptly apiculate; the base rounded or slightly narrowed; upper surface glabrous, lower cinereous and with some scattered pubescence; basal nerves 2 pairs, one of them branching on one side: lateral nerves 2 or 3 pairs, all ascending and all rather prominent: transverse veins not prominent; length 5 to 6·5 in., breadth 2·5 to 3·75 in., petiole 1 to 2 in., thickened towards the apex. *Panicles* towards the apices of the

branches, axillary and terminal, stellate-pubescent, slender, spreading, many-branched. *Flowers* very numerous, 1 in. long, the pedicels slender and rather longer. *Calyx* when expanded rotate, cut half way down into triangular very acute or acuminate spreading teeth, densely stellate-tomentose outside. *Petals* broadly oblanceolate, obtuse, narrowed to the base. *Stamens* 5-delphicus. *Staminodes* apparently absent. *Ovary* globose, densely tomentose, not visibly ridged, 5-celled. *Style* filiform, tapering, straight, glabrous. *Fruit* unknown.

Perak, at elevations from 600 to 1000 feet: King's Collector, Nos. 7616 and 7730.

A species distinguished by its slender hoary panicles, with flowers by far more numerous than in any of the other species described here.

7. *PENTACE CURTISII*, n. sp. King. A large tree: the young branches slender, with dark-coloured bark, very minutely adpressed-lepidote, not hairy. *Leaves* ovate elliptic, with a short abrupt blunt acumen, the base rounded: upper surface glabrous, the lower cinereous; basal nerves 2 pairs, one pair slender and close to the margin, the other branching on one side: lateral nerves 2 or 3 pairs; all ascending and rather prominent beneath: length 3·25 to 5·5 in., breadth 2·25 to 2·75 in.; petiole ·75 to 1 in. slender, slightly thickened at apex. *Panicles* mostly terminal (a few smaller axillary) 4·5 to 6 in. long with sparse cinereous stellate tomentum and scales, few-branched, and few-flowered. *Flowers* 15 in. long, on pedicels shorter than themselves. *Calyx* widely campanulate, stellate-tomentose outside; its teeth as long as the tube, broadly triangular, rather blunt. *Petals* oblanceolate or obovate-obtuse, much narrowed to the base. *Staminodes* lanceolate, acuminate, half as long as the filaments. *Stamens* in 5 bundles. *Ovary* turbinate, with 8 or 9 blunt ridges, lepidote-pubescent: style rather stout, cylindric, shorter than the stamens. *Fruit* 5 in. long, with 8 semi-elliptic membranous wings 2 in. broad.

Penang; Curtis, No. 1573.

8. *PENTACE EXIMIA*, n. sp., King. A tree 50 to 70 feet high: young branches slender, dark-coloured, glabrous. *Leaves* ovate-elliptic to ovate-rotund, shortly and abruptly acuminate, the base slightly narrowed or rounded: upper surface glabrous, shining: lower paler and dull; basal nerves 1 pair, bold and reaching to the apex, often with a slender small sub-marginal pair: lateral nerves usually only one pair, short and curving; all rather bold beneath: length 4 to 5·5 in., breadth 2 to 4 in.; petiole ·75 to 1·1 in., thickened at the apex. *Panicles* terminal, 3·5 to 5 in. long, (longer in fruit), minutely scurfy-tomentose, with



rather numerous spreading branches. *Flowers* numerous, .1 in. long, the pedicels about the same length. *Calyx* densely scaly outside, the teeth triangular. *Petals* cuneate, obtuse, narrowed to a broad claw. *Stamens* about 25, in groups of 5. *Staminodes* lanceolate. *Ovary* subglobose, 10-ridged (the ridges in pairs), scaly and pubescent, 5-celled, the cells with imperfect septa and thus falsely 10-celled. *Styles* 10, much shorter than the stamens, free, or united when young at the base only. *Fruit* about .5 in. long, with 8 radiating semi-elliptic wings .1 to .15 in. broad, minutely adpressed-scaly.

Perak; at elevations under 1000 feet, King's Collector, Nos. 3482 and 3649.

This agrees with *P. Curtisii* in having 8-winged fruit, but the flowers are much smaller. The styles moreover are shorter than the ovary and quite distinct, which is the case in no other species of this genus which I have yet met with.

9. *PENTACE SCORTECHINII*, n. sp. King. A tree? young branches slender, glabrous, dark-coloured. *Leaves* elliptic-oblong, shortly caudate-acuminate, the base more or less cuneate: both surfaces quite glabrous, concolorous; basal nerves 1 pair very bold, as is the midrib; lateral nerves (from the midrib) 1 or 2 pairs, not conspicuous: length 7 to 9 in., breadth 2.75 to 3.5 in.; petiole less than .5 in., stout. *Panicles* terminal and axillary, slender, only about half the length of the leaves, few-branched, minutely tomentose. *Flowers* rather crowded, .25 in. long, on pedicels shorter than the calyx. *Calyx* widely tubular-campanulate, minutely scurfy-tomentose outside, cut a third of its depth into 5 small triangular reflexed teeth. *Petals* obovate, obtuse, much narrowed to the base. *Stamens* in 5 bundles of 15 each. *Staminodes* lanceolate, half as long as the stamens. *Ovary* ovoid, obscurely 5-ridged, scaly, 5-celled. *Style* cylindric, tapering, longer than the stamens. *Fruit* unknown.

Perak, Father Scortechini, No. 119b.

Only once collected and without fruit. A very distinct species.

10. *PENTACE GRIFFITHII*, n. sp., King. A tree: young branches slender, dark-coloured, glabrous. *Leaves* ovate-elliptic, tapering about equally to the acute apex and base; upper surface shining, lower dull; basal nerves 2 pairs, the lower pair slender and sub-marginal, the upper branched on one side and bold (as is the midrib), ascending, curved; lateral nerves (from the midrib) 2 pairs; length 4 to 7 in., breadth 2.25 to 3 in.; petiole nearly 1.5 in. long, thickened at both ends, but especially at the apex. *Panicles* terminal, slender, few-branched, lax, minutely

cinereous-tomentose. *Flowers* not very numerous, large for the genus (.25 in. long and .25 in. in diam.), on pedicels about as long as the calyx. *Calyx* widely campanulate, almost rotate, minutely stellate-tomentose outside; the teeth as long as the tube, spreading. *Petals* ovate, obtuse, rather suddenly contracted into a linear claw. *Stamens* in 5 groups of 12 or 13 each. *Staminodes* lanceolate, as long as the filaments. *Ovary* sub-globose, slightly compressed, minutely stellate-tomentose and scaly, obtusely 5-angled, 5-celled. *Style* cylindric, rather shorter than the filaments. *Fruit* nearly 1 in. long, with 10 radiating membranous, horizontal striate, minutely scaly, semi-elliptic, membranous wings, each .35 in. broad.

Tavoy in Tenasserim; Griffith, Aplin.

A very distinct species only once collected within recent years, by Mr. Aplin. There is, however, in the Kew Herbarium a twig of it collected by Griffith many years ago bearing this note in Griffith's handwriting "*Tiliacearum* gen. nov. *capsulis pluri-alatis*." Although this plant has hitherto been found only in territory which is politically Burmese, yet Tavoy (being at the southern extremity of Tenasserim) is practically Malayan in its Flora and Fauna. I therefore include it here.

11. *PENTACE STRYCHNOIDEA*, n. sp., King. A tree 60 to 80 feet high: young branches slender, cinereous, glabrous. *Leaves* ovate-elliptic rarely ovate-oblong, shortly and abruptly acuminate, the base rounded or slightly narrowed; upper surface shining, glabrous; lower pale and dull; boldly 3-nerved and often with a slender sub-marginal pair of nerves; length 3 to 4 in., breadth 1.75 to 2.25 in.; petiole .75 in. slightly thickened at the apex. *Panicles* terminal, 3 to 6 in. long, few-branched, lax, minutely lepidote-puberulous. *Flowers* rather large for the genus (.2 in. long). *Calyx* cup-shaped, tomentose outside, cut more than half way down into 5 triangular acute teeth. *Petals* oblanceolate, slightly oblique, much narrowed to the base. *Stamens* in 5 bundles of about 20 each. *Staminodes* linear-lanceolate. *Ovary* ovoid-globose, obtusely 5-ridged, minutely tomentose and lepidote, 5-celled. *Style* filiform, as long as the stamens. *Fruit* unknown.

Perak; at elevations of from 500 to 1000 feet, King's Collector, No. 3478.

### 3. *SCHOUTENIA*, Korth.

Trees with alternate simple pinnately-nerved leaves. *Flowers* axillary, solitary or in clusters; or in terminal few-flowered panicles. *Calyx* campanulate, 5-lobed; lobes valvate, accrescent, coloured. *Petals*

small, linear without<sup>1</sup> claw, or absent. *Stamens* numerous, free, sometimes inserted on the apex of a short gynophore; anthers oblong, 2-celled: cells parallel, with longitudinal sutural dehiscence. *Staminodes* 0. *Ovary* sessile or shortly stalked, imperfectly 3 to 5-celled; cells with 2 ovules from the base of the axile placentas, style filiform; stigmas 3 to 5, linear fleshy, reflexed. *Capsule* with crustaceous fragile pericarp, dehiscing irregularly, 1-celled (by abortion), 1- to 3-seeded. *Seeds* subglobose, with leathery smooth testa, exalbuminous: the cotyledons large, leafy, thin, crumpled: embryo straight. Distrib. 5 species, of which 4 are Malayan and 1 Cambodian.

Flowers in panicles or solitary, axillary.

Calyx very accrescent very deeply lobed 1. *S. Mastersii*.

„ slightly accrescent not deeply lobed 2. *S. Kunstleri*.]

Flowers in dense axillary glomeruli ... 3 *S. glomerata*.

1. *SCHOUTENIA MASTERSII*, King. A tree 60 to 80 feet high: young branches slender, dark-coloured, at first scaly but soon glabrous. *Leaves* thinly coriaceous, ovate-lanceolate, slightly obovate, shortly and bluntly acuminate, the base rounded; upper surface glabrous, the lower minutely and softly tawny-tomentose; nerves slightly prominent beneath, about 3 pairs lateral and 1 pair basal: length .75 to 3.25 in.; breadth .4 to 1.1 in.; petiole less than .1 in. *Flowers* solitary and axillary, or in terminal leafy panicles; the pedicels from .35 to .75 in. according to age, tawny-tomentose, jointed below the middle. *Calyx* membranous, pink, conspicuously veined, at first widely campanulate, .35 in. long, with 5 shallow teeth becoming with the ripening of the fruit, rotate, flat 1.5 to 2 in. in diam., and 5-angled; pubescent outside, glabrous within. *Filaments* very slender, longer than the style. *Ovary* obovoid-globose, tawny-tomentose. *Style* stout, three times as long as the ovary, tomentose: stigmas scaly. *Fruit* depressed-globose, .3 in. in diam., minutely tomentose. *Chartacalyx accrescens*, Mast. in Hook. fil. Fl. Br. Ind. i. 382.

Malacca, Penang, Perak. Distrib. Borneo.

On this plant the late Dr. Maingay founded his genus *Chartacalyx*. The only points, however, in which it differs from *Schoutenia* (as defined by Benthams and Hooker) are the absence of petals and the presence of a stalk to the ovary on the upper part of which the stamens are inserted; and these appear to me to be, in this order, differences of quite minor importance. Maingay never saw the fruit of this; but copious fruiting specimens have recently been collected and the fruit is found to be exactly that of *Schoutenia*. As regards the structure of the seeds of

*Schoutenia*, Korthals (the author of the genus) says nothing: nor does Bennet who (Pl. Jav. Rar. p. 239, t. 46) describes at greater length than Korthals the species *S. ovata*, the only one then known. Bennett neither describes nor figures albumen in the seed. Hasskarl (Retzia 1, 136) describes the seeds as exalbuminous, and I find none in the seeds of these species of which I have been able to examine ripe fruit. The only other known species are *S. ovata*, Korth. from Java; and *S. hypoleuca*, Pierre (Fl. Cochinchine t. 134) from Cambodia.

2. *SCHOUTENIA KUNSTLERI*, n. sp., King. A tree 60 to 70 feet high: young branches cinereous, rather rough-glabrous. *Leaves* thinly coriaceous, narrowly obovate-oblong or oblanceolate, acute, the margin slightly waved, slightly narrowed to the rounded 3- to 5-nerved base; upper surface glabrous, shining: lower sub-silvery; the lateral nerves 4 or 5 pairs, spreading, curving, inter-arching near the margin, prominent on the lower surface as are the basal nerves and the numerous slightly curved transverse veins. *Flowers* crowded towards the ends of the branches, in numerous short few-flowered scurfy-tomentose racemes or cymes: pedicels from .5 to .75 in. long, jointed and bracteolate above the base, the bracteole oblanceolate. *Calyx* campanulate, membranous, coloured and veined, stellate-hairy on both surfaces, .5 to .75 in. long, according to age, cut to the base into 5 ovate spreading lobes. *Petals* 0. *Stamens* on a slightly elevated torus. *Ovary* sessile, sub-globose, densely tomentose, 5-celled. *Style* longer than the stamens. *Stigmas* 5, short, fleshy. *Fruit* 1-celled, 1-seeded, surrounded by the slightly accrescent persistent calyx.

Perak at elevations of from 300 to 800 feet: King's Collector, No 3409: on Ulu Tupa, Wray, No. 2692.

According to the field notes of Messrs. Kunstler and Wray, the calyx is yellow when young, but becomes brown when the fruit ripens.

3. *SCHOUTENIA GLOMERATA*, n. sp., King. A tree from 40 to 60 feet high: young branches slender, cinereous, minutely pubescent. *Leaves* membranous, glabrous, elliptic-oblong, acute or shortly and bluntly acuminate, the margins slightly waved; the base broad, rounded or emarginate, 3-nerved, the upper pair of nerves very strong, running to the apex of the leaf and joined to the midrib by numerous prominent curving transverse secondary nerves, all very prominent on the pale silvery shining under surface: length 10 to 15 in., breadth 3.5 to 5.5 in.; petiole only .25 in. long, stout, wrinkled. *Cymes* condensed, very crowded, axillary, 1 to 1.5 in. in diam. *Flowers* .25 in. long and .3 in. wide, on tomentose rufous pedicels about .2 in. long. *Calyx* widely

campanulate, densely rufous-tomentose; teeth 5, broadly triangular, sub-erect. *Petals* 0. *Stamens* numerous; the filaments slender, longer than the calyx. *Ovary* ovoid-globose, densely tawny-tomentose, 5-celled: style longer than the stamens: stigmas short, sub-globose. *Fruit* depressed globose, .75 in. in diam., sparsely stellate-tomentose, becoming glabrous, covered only at the base by the slightly accrescent calyx.

Johore; on Gunong Panti, King's Collector, No. 159.

#### 4. *BERRYA*, Roxb.

A tree. *Leaves* alternate, ovate, acuminate, glabrous; base cordate, 5-7-nerved. *Panicles* large, many-flowered, terminal and axillary. *Calyx* campanulate, irregularly 3-5-lobed. *Petals* 5, spatulate. *Stamens* many, inserted on a short torus; anthers didymous, lobes divergent, opening lengthwise. *Staminodes* 0. *Ovary* 3-4-lobed, cells 4-ovuled; style consolidated, stigma lobed; ovules horizontal. *Fruit* loculicidally 3-4-valved, each valve 2-winged. *Seeds* pilose; albumen fleshy; cotyledons flat leafy, radicle superior next the hilum.—Distrib. The following is the only species.

*BERRYA AMMONILLA*, Roxb. Hort. Beng., 42. A large tree, glabrous except the inflorescence. *Leaves* membranous, broadly ovate, acuminate, the base slightly narrowed and cordate: both surfaces shining, minutely reticulate: basal nerves 2 or 3 pairs, lateral 5 or 6 pairs: length 4 to 8 in., breadth 3 to 5 in.; petiole .75 to 2.75 in. *Panicles* terminal, or in the upper axils, branching, 6 to 10 in. long, scurfy-pubescent: flowers .35 in. in diam.; their pedicels slender, .3 to .5 in. long. *Petals* longer than the calyx, narrowly oblong, obtuse, glabrous. *Anthers* half as long as the petals. *Ovary* ovoid, truncate, depressed at the origin of the styles, 6 to 8-ridged, pubescent. *Fruit* with 6 radiating, falcate, membranous, striate, deciduously stellate-tomentose wings .8 in. long. *Seeds* small: 1 to 4 in. each cell, covered with prurient pale brown hairs. Roxb. Fl. Ind. ii. 639; Corom. Plants, ii. t. 264; Wall. Cat. 1068; W. & A. Prodr. i. 81; Wight Ill. t. 34; Thwaites Enum. 32; Beddome Flor. Sylvat. t. 58; Kurz Fl. Burm. i. 155; Hook. fil. Fl. Br. Ind. i. 383.

South Andamans. Distrib. Burmah, Southern Peninsula, India, Ceylon.

#### 5. *GREWIA*, Linn.

Trees or shrubs more or less stellate-pubescent. *Leaves* entire, 1-9-nerved. *Flowers* axillary and few, or more numerous and panioled. *Sepals* distinct. *Petals* 5, glandular at the base, sometimes 0. *Stamens*

many on a raised torus. *Staminodes* 0. *Ovary* 2-4-celled, cells opposite the petals, 2-many-ovuled; style subulate, stigma shortly lobed. *Drupe* fleshy or fibrous, entire, or 2-4-lobed; stones 1-4, 1-2-seeded, with false partitions between the seeds. *Seeds* ascending; albumen fleshy or rarely 0; cotyledons flat. *Distrib.* About 60 species, chiefly tropical.

Sect. I. *Grewia* proper. *Flowers* axillary or terminal. *Fruit* fleshy or crustaceous, usually lobed ... ..

1. *G. umbellata*.

Sect. II. *Microcos*. *Inflorescence* terminal, in paniced cymes. *Flowers* involucrate. *Drupe* fleshy, entire ... ..

2. *G. paniculata*.

Sect. III. *Omphacarpus*. *Inflorescence* terminal, or terminal and axillary. *Flowers* involucrate. *Drupe* with a corky or fibrous rind.

*Fruit* minutely tomentose: mesocarp thick, soft, pulpy, and with many fibres; pyrene single, small.

Pyrene membranous: leaves softly tomentose beneath ... ..

3. *G. fibrocarpa*.

Pyrene cartilaginous: leaves sparsely stellate-hispid beneath ... ..

4. *G. globulifera*.

*Fruit* glabrous: mesocarp with thin pulp and a few fibres: pyrenes 2 or 3, bony.

Leaves sparsely-stellate pubescent beneath: drupe not narrowed into a pseudo-stalk... ..

5. *G. latifolia*.

Leaves glabrescent or pubescent beneath: drupe narrowed into a long pseudo-stalk... ..

6. *G. antidesmaefolia*.

Leaves quite glabrous.

Basal nerves bold and reaching beyond the middle.

*Fruit* .5 in. long, furrowed, not compressed ... ..

7. *G. laurifolia*.

*Fruit* 1.4 in. long, not furrowed, compressed ... ..

8. *G. calophylla*.

Basal nerves slender, not reaching to the middle: drupe .75 in. long

9. *G. Miqueliana*.

1. *GREWIA UMBELLATA*, Roxb. Hort. Beng. 42: Fl. Ind. ii. 591.

A shrubby climber 10 to 20 feet long; whole plant except the upper surfaces of the leaves sparsely stellate-puberulous, the bark of the young

branches dark-coloured. *Leaves* oblong-ovate or elliptic, shortly and bluntly acuminate, minutely serrate; base rounded, 3-nerved; upper surface glabrous; the lower pale with the transverse veins prominent and straight: lateral nerves about 3 pairs: length 3 to 4·5 in., breadth 1·5 to 2 in., petiole ·25 in. *Umbels* pedunculate, axillary or terminal, 6 to 8-flowered; the peduncle from ·6 to 1 in. long, with a whorl of small lanceolate glabrous bracteoles at its apex. *Flowers* ·75 in. long when expanded; their pedicels hirsute, unequal, from ·2 to ·5 in. long. *Sepals* ribbed and tomentose outside, glabrous inside, linear-oblong, reflexed. *Petals* much shorter than the sepals, oblong, each springing from the back of a large orbicular claw with hirsute edges. *Torus* long, ridged, tomentose. *Fruit* depressed-globular, obtusely 2- to 4-angled and with 2 to 4 shallow lobes, pericarp sparsely stellate-puberulous; endocarp pulpy; pyrene 2 to 4-celled; its loculi 1-seeded, the endocarp bony. Wight Ic. 83; Wall. Cat. 1084; Mast. in Hook. fl. Fl. Br. Ind. i. 385.

Malacca, Penang, Griffith, Maingay. Perak, King's Collector, Wray.

Roxburgh has left an excellent coloured drawing of this in the library of the Calcutta Herbarium, and there is no doubt about his plant. I cannot agree in identifying with this *G. pedicellata*, Roxb., which that author received from Amboyna: nor do I think that any *Grewia* from the Peninsula of Hindustan is referable to this species

2. *GREWIA PANICULATA*, Roxb. Fl. Ind. ii. 591. A bushy tree 15 to 30 feet high: young branches scurfy stellate-tomentose, ultimately glabrous, their bark brown. *Leaves* coriaceous, cuneate-obovate to elliptic; the apex blunt, shortly and abruptly acuminate, sometimes 3-lobed and unequal, obscurely serrate-dentate; the base rounded, 3-nerved; upper surface powdered with minute sparse stellate pubescence, the midrib and nerves tomentose: lower surface uniformly stellate-tomentose; the veins transverse, little curved, bold; lateral nerves 4 or 5 pairs, ascending, rather straight, prominent beneath: length 3 to 6 in., breadth 1·5 to 2·75 in.; petiole 25 in., tomentose: stipules glabrescent, lanceolate, often united in pairs, rather shorter than the petioles. *Panicles* 2·25 to 3·5 in. long, terminal or axillary, rusty-tomentose; bracteoles numerous, linear, sometimes bifid: branches spreading. *Flowers* ·25 in. long, the pedicels rather shorter. *Sepals* spreading, concave, obovate narrowed to the base, the edges thin; tomentose on the outer, pilose on the inner, surface. *Petals* shorter than the sepals, oblong, blunt, expanded at the base into a concave claw, hirsute especially outside. *Torus* cup-shaped, short, the lip tomentose. *Ovary* ovoid, stellate-tomentose, 4-celled, each cell with several ovules. *Fruit* ob-

ovoid, recurved, with many curved striae, pericarp membranous, minutely and sparsely stellate-pubescent, the mesocarp fibrous with an outer layer of pulp: pyrene 1-celled, 1-seeded; endocarp stony. Wall. Cat. 1097, partly; Miq. Fl. Ind. Bat. i. pt. 2, 203; Mast. in Hook. fil. Fl. Br. Ind. i. 393. *G. Blumei*, Hassk. Tijdschr. Nat. Gesch. xii. 130; Miq. Fl. Ind. Bat. i. pt. 2, 203. *Microcos tomentosa*, Smith in Rees, Cycl. *G. affinis*, Hassk. Cat. Hort. Bog. 207, not of Lindl.

Singapore; Malacca, Maingay, No. 250. Griffith, No. 634 (Kew Distrib.). Perak. Penang; common.

I retain for this plant the name adopted for it by Masters in Hooker's Flora of British India. But Blume's *G. paniculata* (Bijdr. 115) was published seven years before Roxburgh's. I have not seen any specimen of Blume's plant: but if it be the same as this, then Blume's name must be substituted for that of Roxburgh as the author of the specific name. If Blume's plant, however, be different from Roxburgh's, then some other name must be found for the latter. That the plant above described is what Roxburgh meant to call *G. paniculata*, his coloured drawing in the Calcutta Herbarium leaves no room for doubt.

3. *GREWIA FIBROCARPA*, Mast. in Hook. fil. Fl. Br. Ind. i. 391. A tree 15 to 40 feet high; young branches, under surfaces of leaves, petioles, inflorescence and fruit densely clothed with yellowish-brown stellate tomentum. *Leaves* membranous, ovate-oblong or elliptic, shortly and abruptly acuminate, minutely and obscurely serrulate, the base rounded and boldly 3-nerved; upper surface scaberrulous, the midrib and nerves tomentose, under surface softly tomentose; the 5 to 7 pairs of lateral nerves and the transverse veins rather prominent beneath: length 4·5 to 9 in., breadth 1·75 to 4 in., petiole ·25 to ·5 in., stout: stipules deeply and narrowly lobed. *Panicles* terminal and in the upper axils, crowded, ·5 to 2 in. long: involucres lanceolate, curved, tomentose. *Flowers* ·25 in. long, their pedicels much shorter. *Sepals* obovate-elliptic, very tomentose externally, the edges inflexed, sparsely pilose internally. *Petals* minute, sub-orbicular, sometimes absent. *Torus* short, hirsute. *Ovary* ovoid-globose, tomentose; the style short, conical, glabrous. *Fruit* soft, ovoid or obovoid, compressed, 1·25 in. long and ·75 in. in diam., the pericarp membranous and densely tomentose outside, mesocarp fibrous and pulpy; pyrene small, solitary, leathery, 1-celled, 1-seeded. *G. paniculata*, Wall. (Cat. No. 1097 partly) not of Roxb.

Penang; Wallich, Curtis. Malacca; Griffith; Maingay, No. 248, (Kew Distrib.). Perak; Scortechini, King's Collector, Wray. Common.



In the fruit both of this and of *G. globulifera*, the mesocarp forms a thick pulp with many fibres intermixed, and the solitary pyrene is small with a soft coat.

4. *GREWIA GLOBULIFERA*, Mast. in Hook. fil. Fl. Br. Ind. i. 391. A small shrubby tree; young branches densely covered with short yellowish-brown tomentum. *Leaves* thinly coriaceous, broadly elliptic, sometimes slightly obovate and unequal-sided, shortly and abruptly acuminate, entire, the base rounded, boldly 3-nerved: upper surface scaberrulous, glabrous except the minutely tomentose midrib and nerves: under surface shortly and sparsely stellate-hispid: main nerves 7 to 8 pairs, spreading, prominent beneath, the transverse nerves rather thin, the reticulations minute but distinct: length 4·5 to 10 in., breadth 3 to 6 in., petiole ¼ to ⅞ in., tomentose. *Panicles* often on long peduncles, axillary and terminal, narrow, few-flowered, covered with soft yellowish stellate tomentum: length 2·5 to 4·5 in. (of which the peduncle may be more than half). *Flowers* ⅜ in. long, their pedicels much shorter. *Sepals* oblong, spreading, curved inwards, tomentose on both surfaces, the edges much incurved. *Petals* much shorter than the sepals, glabrous, linear-lanceolate, without any distinct claw but sometimes more or less thickened and hairy at the base. *Torus* a very shallow cup with hirsute edge. *Ovary* ovoid, pointed, tomentose; style as long as the ovary, cylindric, glabrous. *Fruit* usually solitary at the apex of a branch of the panicle, sub-obovoid, compressed, 1·25 in. long and ⅙ in. in diam.; pericarp membranous minutely tomentose, the mesocarp pulpy and very fibrous; the single pyrene much smaller, endocarp cartilaginous, 1-celled, 1-seeded.

Malacca; Griffith, No. 635; Maingay, No. 245, (Kew Distrib.); Harvey. Perak; Scortechini, King's Collector, Wray: at low elevations.

In its fruit this much resembles *G. fibrocarpa*. The drupe, however, of this is obovoid not ovoid, and the stone is larger with cartilaginous not membranous endocarp. The leaves also differ in being sparsely shortly hispid-pubescent instead of softly tomentose. A near ally of this species is also *G. latifolia*, Mast. from which this differs in its petals having no distinct claw, whereas in those of *G. latifolia* the claw is larger than the limb. This also differs in the shape of its ovary and style, and in the very different appearance of its drupe.

5. *GREWIA LATIFOLIA*, Mast. in Hook. fil. Fl. Br. Ind. i. 392. A shrubby tree 20 to 40 feet high: young branches rather stout, minutely but harshly tawny-or cinereous-tomentose. *Leaves* coriaceous, drying a dark brown, broadly elliptic, shortly and abruptly sub-acuminate,

entire, slightly narrowed to the rounded 3-nerved base: upper surface glabrescent, the midrib sub-tomentose, lower surface rather sparsely rusty stellate-pubescent: main lateral nerves 5 to 8 pairs, prominent beneath as are the rather straight transverse veins: length 6 to 9 in., breadth 3·5 to 4·5 in.; petiole ·5 to ·75 in. stout, tomentose. *Panicles* short, axillary or terminal, rusty-tomentose 1·5 to 2·5 in. long and 1 in. or more broad, few-flowered: involucre ovate-lanceolate. *Flowers* 2·5 in. long, their pedicels shorter. *Sepals* oblong, tomentose on both surfaces. *Petals* shorter than the sepals, oblong, acute, the hirsute claw larger than the glabrescent limb. *Torus* cup-shaped, with hirsute margin. *Ovary* depressed-globose: style cylindric, puberulous. *Drupe* obovoid, ·75 in. long and ·5 in. in diam., pericarp at first sparsely pubescent, afterwards glabrous, mesocarp fibrous and pulpy: pyrene single, 1-celled, 1-seeded: endocarp bony.

Malacca; Griffith, (Kew Distrib.) 638/1; Maingay. Perak; King's Collector, Scortechini, Wray.

6. *GREWIA ANTIDISMÆFOLIA*, n. sp., King. A tree usually 30 to 40, but sometimes 50 to 60 feet, high: young branches glabrous, their bark cinereous. *Leaves* membranous, glabrescent when young, when old quite glabrous, elliptic-oblong, acute or shortly acuminate, entire, the base usually cuneate but sometimes rounded, boldly 3-nerved; lateral main nerves 5 or 6 pairs, little curved, ascending, prominent beneath; length 4·5 to 8 in., breadth 1·5 to 2·75 in.; petiole ·4 to ·6 in. slender. *Panicles* pedunculate, axillary and terminal, slender, the branches short, spreading, few-flowered, densely but minutely cinereous, velvety, 2 to 3 in. long. *Flowers* ·25 in. long, their pedicels shorter. *Sepals* elliptic, slightly obovate, their edges in the upper half much incurved, tomentose outside, pubescent inside. *Petals* much shorter than the sepals, oblong, blunt, the glabrescent limb about as long as the broad thickened claw; claw pilose behind, with hirsute edges in front. *Torus* cylindric, glabrous, with wide wavy hirsute mouth. *Ovary* ovoid-globose, pilose when young, glabrescent when adult, shorter than the cylindric glabrous style. *Fruit* pyriform, obtusely 3-angled, narrowed to a long pseudo-stalk, ·75 in. long (including the narrowed portion) about ·35 in. in diam.; pericarp glabrous, mesocarp slightly fleshy with a thin fibrous inner layer. *Pyrenes* 3, with bony endocarp, two of them abortive and the third 1-celled, 1-seeded.

Perak: at low elevations; common, Scortechini, King's Collector, Wray.

Var. *hirsuta*; young branches, lower surfaces of leaves, and ovary pubescent to tomentose.

Perak; King's Collector.

7. *GREWIA LAURIFOLIA*, Hook. in Hook. fl. Fl. Br. Ind. i. 392. A tree 20 to 30 feet high; all parts except the inflorescence glabrous: young branches with dark-coloured bark. *Leaves* thinly coriaceous, oblong-lanceolate or lanceolate, acuminate or acute, entire; the base rounded boldly 3-nerved: both surfaces shining; lateral nerves 1 or 2 pairs, alternate; length 4 to 6 in., breadth 1·5 to 2·5 in., petiole ·5 to ·7 in. *Panicles* terminal and axillary, 1·5 to 4 in. long, lax, few-flowered, puberulous: bracteoles few, linear, fugaceous. *Flowers* ·2 in. long, their pedicels about ·15 in. *Sepals* ovate, concave, the edges much inflexed, minutely tomentose on both surfaces. *Petals* much shorter than the sepals, oblong, often absent. *Torus* cup-shaped, its rim hirsute. *Ovary* globose, sub-glabrous, 4-celled. *Style* thick, cylindric, tapering, glabrous. *Drupe* ovoid, ·5 in. long, the pedicel about as long, with 1 or 2 vertical furrows, pericarp glabrous, endocarp fleshy and fibrous: pyrene 1 to 3-celled, but usually only one cell containing a single seed: endocarp bony.

Malacca; Griffith, Maingay. Penang; Curtis. Perak; Scortechini, King's Collector. Distrib. Sumatra.

8. *GREWIA CALOPHYLLA*, Kurz Andam. Rep. App. B. iii; Flor. Burm. i. 157. A tree 20 to 30 feet high: all parts glabrous except the minutely velvety tawny inflorescence: young branches slender, dark-coloured. *Leaves* thinly coriaceous, shining, ovate-lanceolate to ovate-elliptic, acuminate, entire; the base rounded or slightly cuneate, 3-nerved; lateral nerves 3 or 4 pairs, ascending; transverse nerves slender: length 4 to 7 in., breadth 1·75 to 3 in., petiole ·3 to ·75 in. *Panicles* pedunculate, axillary or terminal, few-flowered, 1·5 to 3 in. long. *Flowers* ·5 in. long, their pedicels very short. *Sepals* narrowly oblong, the edges much incurved, minutely velvety, much reflexed. *Petals* about half the length of the sepals and much narrower, lanceolate; the limb subulate; the claw ovoid, expanded, thick and densely tomentose at the margin. *Torus* cylindric, puberulous outside. *Ovary* ovoid, pointed, style long filiform, both puberulous. *Fruit* obovoid, compressed, 1·4 in. long and ·75 in. in diam.; pericarp membranous, glabrous, shining; mesocarp thick, pulpy and fibrous: pyrenes 3, of which one is 2-celled but contains only a single seed, the others abortive; the endocarp bony. Mast. in Hook. fl. Fl. Br. Ind. i. 392.

Nicobar Islands, Kurz: S. Andaman, Kurz, King.

This is very near *G. laurifolia*, Hook. but has very much larger fruit. A Malacca plant (Griffith, No. 630/2 Kew Distrib.) resembles this in leaves but not in flower. The only specimens which I have seen are too imperfect for determination.

9. *GREWIA MIQUELIANA*, Kurz, in *Flora* for 1872, p. 398. A tree 20 to 40 feet high: young branches at first very sparsely and minutely lepidote, afterwards glabrous, the bark dark brown. *Leaves* thinly coriaceous, glabrous, shining, ovate-lanceolate to lanceolate, shortly acuminate, entire, the base cuneate, faintly 3-nerved; both surfaces glabrescent soon becoming glabrous: main lateral nerves 5 or 6 pairs, not prominent; length 3 to 5 in., breadth 1 to 1.75 in.; petiole .2 to .3 in., scaly-tomentose; stipules oblong, blunt, oblique. *Panicles* axillary and terminal, lax, few-flowered, sparsely lepidote and puberulous, 1 to 2 in. long. *Flowers* .3 in. long, their pedicels very short. *Sepals* oblanceolate, acute, the edges inflexed, minutely tomentose. *Petals* much shorter than the sepals, the glabrescent linear acute limb shorter and narrower than the thickened rounded tomentose claw. *Torus* short, cylindric, puberulous with villous edges. *Ovary* globose-ovoid, tomentose, shorter than the cylindric glabrous style, 2-celled. *Drupe* pyriform, .75 in. long and .5 in. in diam., glabrous: pericarp smooth, glabrous, shining; mesocarp fibrous with a little pulp: pyrenes 2, each 1-celled, one 1-seeded, the other barren: the endocarp bony. *Inodaphnis lanceolata*, Miq. Fl. Ind. Bat. Suppl. 357; Ann. Mus. Lugd. Bat. iii. 89; Meisn. in DC. Prod. xv. 1, 265.

Malacca; Maingay, (Kew Distrib.) No. 244. Perak; Scortechini, King's Collector, at low elevations. Dindings; Curtis, No. 1613. Distrib. Sumatra.

There is an authentic fruiting specimen in the Calcutta Herbarium of Miquel's *Inodaphnis lanceolata* collected in Sumatra. And there is no doubt whatever that Kurz was right in referring the plant to *Grewia*. Miquel founded his genus on specimens without flowers; and, apparently from the structure of the fruit, he suggested its affinity to *Inocarpus*. Later on he suggested (Ann. Mus. Lugd. Bat. iii. 89) its affinity with the Rosaceous genera *Ohrysobalanus*, *Parastemon* and *Diemenia* (= *Trichocarya*). Meissner in DC. Prod. (l. c.) briefly described the genus at the end of *Hernandiaceae*, but without indicating his opinion as to its proper place. Had these distinguished botanists had an opportunity of examining flowers, they would doubtless have referred it without hesitation to *Grewia*. The practice (fortunately confined to a few authors) of founding genera on specimens without flowers cannot be too strongly condemned.

#### 6. TRIUMFETTA, Linn.

Herbs or undershrubs, generally more or less covered with stellate hairs. *Leaves* serrate or dentate, simple or lobed. *Flowers* yellowish, in dense cymes. *Sepals* 5, oblong, concave. *Petals* 5. *Stamens* 5-35,

springing from a fleshy, lobed, glandular torus. Ovary 2-5-celled, cells 2-ovuled; style filiform, stigma 5-toothed. Fruit globose or oblong, spiny or bristly, indehiscent or 3-6-valved. Seeds 1-2 in each cell, pendulous, albuminous embryo straight, cotyledons flat. Distrib. A genus of about 40 very variable species, mostly tropical weeds.

Fruit tomentose, bristles shorter than itself	...	1.	<i>T. rhomboidea</i> .
„ villous	„ longer	„	2. <i>T. pilosa</i> .
„ glabrous	„ „	„	3. <i>T. annua</i> .

1. TRIUMFETTA RHOMBOIDEA, Jacq. DC. Prod. i. 507 Erect, herbaceous or shrubby, annual, glabrous or pubescent. Leaves polymorphous, but usually rhomboid, 3-lobed, coarsely and unequally serrate, the upper more or less lanceolate; length 1·75 to 3 in., breadth nearly as much in the rhomboid, much less in the lanceolate forms; petioles ·25 to 1·25 in. Peduncles short, 4 to 6-flowered. Flowers about ·15 in. long, the buds clavate. Sepals apiculate: petals oblong, ciliate at the base. Stamens 8 to 15. Fruit about ·2 in. in diam., globose, tomentose, covered with short glabrous or pubescent hooked spines. Masters in Hook. fil. Fl. Br. Ind. i. 395. *T. angulata*, Lam. Dict. iii. 41; Wight Ic. t. 320; W. & A. Prodr. i. 74; Thwaites Enum. 31; Dalz. & Gibs. Bomb. Fl. 25; Wall. Cat. 1075, 2, C; Miq. Fl. Ind. Bat. pt. i. 197. *T. angulata*, *β. acuminata*, Wall. Cat. 1075 *β. T. Bartramia*, Roxb. Fl. Ind. ii. 463; Wall. Cat. 1075, D, E. *T. trilocularis*, Roxb. Fl. Ind. ii. 462; Wall. Cat. 1083. *T. vestita*, Wall. Cat. 1078, in part.

In all the provinces: a weed. Distrib. British India, Ceylon, Malacca, Archipelago, China, Africa.

2. TRIUMFETTA PILOSA, Roth Nov. Sp., 233. Erect, herbaceous or shrubby, annual; the whole plant, but especially the young branches and the under surface of the leaves, villous, stellate-tomentose. Leaves; the lower broadly ovate, sometimes 3-lobed; the upper ovate to ovate-lanceolate, acute or acuminate, unequally and rather coarsely serrate or dentate; length 2 to 4·5 in., breadth 1 to 1·75 in.; petiole ·5 to 1 in. Stipules linear-subulate. Peduncles many-flowered, usually shorter than the petiole. Calyx ·25 in. long, sparsely hairy. Petals spathulate-oblong, nearly as long as the calyx. Fruit globular, about ·25 in. in diam., villous, densely covered with spines longer than itself which are hispid below, glabrous above, and usually hooked at the apex. W. & A. Prodr. i. 74; Hook. fil. Fl. Br. Ind. i. 394. *T. pilosa*, var. *β*, Thwaites Enum. 31; Dalz. & Gibs. Bomb. Fl. 25. *T. tomentosa*, Wall. Cat. 1078 O. *T. glandulosa*, Heyne Herb.; Wall. Cat. 1077, 5. *T. polycarpa*, Wall. Cat. 1079. *T. oblongata*, Link Enum. Pl. Hort. Ber. ii. 5; Wall.

Cat. 1077, 1, 2, 3. *T. ovata*, DC. Prodr. i. 507? *T. pilosa*, Wall. Cat. 1080. *T. pilosa*, var. *a*, Thwaites Enum. 31. *T. vestita*, Wall. Cat. 1078, 1, 2. *T. indica*, Ham. in Wall. Cat. 237, 1078 D; W. & A Prodr. i. 74. *T. oblonga*, Wall. in Don. Prodr. 227.

Malacca, Singapore: Perak, King's Collector, No. 989; and probably in all the provinces. Distrib. British India, Ceylon, Africa.

A common and rather variable weed. The bristles of the fruit are usually hooked at the apex; but in some specimens they are quite straight. The species *T. tomentosa*, was founded by Bojer on specimens collected in Mombassa, having straight fruit-bristles and the lower leaves broadly oval or oblong and often 3-lobed. Many of the Indian forms have been referred to that, but I think they might very well be included in *T. pilosa*, and in the synonymy above quoted I have adopted this view.

3. TRIUMFETTA ANNUA, Linn. Mant. p. 73. Annual, shrubby, erect, 1 to 2 feet high; the whole plant with sparse pale straight hairs, the older parts glabrescent. *Leaves* thin, ovate-acuminate, coarsely dentate, 3-nerved, 3 to 5 in. long, by 1·5 to 2 broad: petioles nearly 1·5 in. *Stipules* subulate, minute. *Peduncles* axillary, 3-flowered. *Calyx* ·25 in. long, nearly glabrous. *Petals* shorter than calyx. *Stamens* 10. *Fruit* globose, pitted, glabrous, ·2 in. across, bearing numerous smooth glabrous thin hooked spines longer than the capsule. DC. Prodr. i. 507; Miq. Fl. Ind. Bat. i. pt. 2, 196; Hook. fil. Fl. Br. Ind. i. 396. *T. polycarpa*, Wall. Cat. 1079, partly. *T. trichoclada*, Link. ex DC. Prodr. i. 507; Wall. Cat. 1082. *T. indica*, Lam. Dict. iii. 420?

Perak: a weed. Distrib. British India, Malay Archipelago, Africa.

## 7. CORCHORUS, Linn.

Herbs or undershrubs, more or less covered with stellate pubescence, or glabrescent. *Leaves* simple. *Peduncles* axillary or opposite to the leaves, 1-2-flowered. *Flowers* small, yellow. *Sepals* 4-5. *Petals* 4-5, glandless. *Stamens* free, indefinite or rarely twice the number of the petals, springing from a short torus. *Ovary* 2-6-celled, style short, stigma cup-shaped. *Capsule* elongated, slender or subglobose, smooth or prickly, loculicidally 2-5-valved, sometimes with transverse partitions. *Seeds* numerous, albuminous, pendulous or horizontal; embryo curved. Distrib. 35 species, throughout the tropics.

Capsules globular	...	...	1. <i>C. capsularis</i> .
„ cylindric, 10-ridged	...	...	2. <i>C. obitorius</i> .
„ „ 6-winged	...	...	3. <i>C. acutangulus</i> .

1. *CORCHORUS CAPSULARIS*, L. sp. 746. Annual, shrubby, glabrescent. *Leaves* lanceolate or oblong-lanceolate, acuminate, coarsely serrate, the base rounded and with 2 subulate appendages: length 2 to 4 in., breadth .75 to 1.5 in., petiole .5 in. or less; stipules linear-subulate .25 to .5 in. *Capsules* axillary, truncate-globose, ridged, wrinkled, sub-muricate, 5-celled. *Seeds* few in each cell. DC. Prodr. i. 505; Roxb. Fl. Ind. ii. 581; W. & A. Prodr. i. 73; Wall. Cat. 1071 A, B, C; Wight. Ic. t. 311; Thwaites Enum. 31; Dalz. & Gibs. Bomb. Fl. 25; Miq. Fl. Ind. Bat. i. pt. 2, 194; Hook. fil. Fl. Br. Ind. i. 397. *C. Marua*, Ham. in Wall. Cat. 6311.—Rumph. Amb. v. t. 78, f. 1.

Cultivated here and there in all the provinces for its fibre which is known in commerce as "Jute." Doubtfully wild.

2. *CORCHORUS OLITORIUS*, L. sp. 746. Annual, shrubby, glabrescent. *Leaves* ovate-lanceolate, serrate, the base rounded and with 2 subulate appendages: length 2 to 4 in., breadth .75 to 2 in., petiole .75 to 1.5 in.; stipules linear, .5 to 1 in. *Capsules* cylindric, 10 ribbed, 5-celled, 2 in. long. DC. Prod. i. 504; Roxb. Fl. Ind. ii. 581; W. & A. Prod. i. 73; Wall. Cat. 1072; 1, 2, 3, 4, D, E, F; Boiss. Fl. Orient. i. 845; Dalz. & Gibs. Bomb. Fl. 25; Miq. Fl. Ind. Bat. i. pt. 2, 195; Thwaites Enum. 31; Hook. fil. Fl. Br. Ind. i. 397. *C. decemangularis*, Roxb. Fl. Ind. ii. 582; Wall. Cat. p. 237, 1072 G.

Doubtfully wild: but occasionally cultivated in all the provinces under the name of "Jute."

3. *CORCHORUS ACUTANGULUS*, Lamk. Dict. ii. 104. Erect, herbaceous, the stems with a broad line of pubescence interrupted and varying in position at the nodes, otherwise glabrous. *Leaves* ovate to ovate-lanceolate, acute or acuminate, serrate, the base rounded, with or without subulate appendages, sparsely hairy on both surfaces; length 1.5 to 2 in., breadth .75 to 1.75 in.; petiole .25 to .75 in. slender, villous at the apex: stipules lanceolate, acuminate, .5 in. long. *Capsules* 1 to 1.5 in. long, cylindric, 6-winged, with 3 terminal bifid beaks, 3-celled. DC. Prodr. i. 505; W. & A. Prodr. i. 73; Wall. Cat. 1069, 1074 D, E; Wight Ic. t. 739; Thwaites Enum. 31; Dalz. & Gibs. Bomb. Fl. 25; Miq. Fl. Ind. Bat. i. pt. 2, 194; Hook. fil. Fl. Br. Ind. i. 398. *C. castuans*? Ham. in Wall. Cat. p. 237, 1074 C. *C. fuscus*, Roxb. Hort. Beng. 42; Fl. Ind. ii. 582; Ham. in Wall. Cat. 1069.

Johore: at the base of Gunong Panti, King's Collector, No. 180. Distrib. India, Ceylon, Australia, Africa, W. Indies.

#### 8. *TRICHOSPERMUM*, Blume.

Trees with penni-nerved, minutely stellate, puberulous leaves.

*Flowers* in axillary or terminal, umbellate, stalked cymes or panicles. *Sepals* 5 valvate, thick. *Petals* 5, membranous with a scale at the base. *Stamens* numerous, free, inserted on the inner surface of an annular marginally villous sub-crenate disk; anthers broad, short, versatile, the connective sub-orbicular. *Ovary* sessile, 2-celled, with numerous ovules on axile placentas: style short, stigma expanded, papillose. *Capsule* orbicular-reniform, much compressed at right angles to the dissepiments, loculicidally 2-valved, many-seeded. *Seeds* sub-lenticular, with a thin imperfect marginally villous arillus; albumen fleshy; embryo central the cotyledons orbicular, foliaceous; radicle straight. Distrib. 3 species 2 of which are Malayan and Polynesian.

1. *TRICHOSPERMUM KURZII*, King. A tree 40 to 60 feet high: bark of young branches very dark-coloured, sparsely and minutely stellate-pubescent when young, speedily glabrous. *Leaves* membranous, ovate-elliptic, shortly acuminate, minutely serrate-crenate especially near the apex; the base rounded, sub-truncate, sub-cordate, boldly 3-nerved: lateral nerves about 4 pairs: the transverse veins sub-horizontal, curved, bold: length 4 to 6 in., breadth 2 to 3 in., petiole about .5 in. *Panicles* solitary, axillary or terminal, stalked, cymose, 2-3-chotomous, much shorter than the leaves when in flower, nearly as long when in fruit, stellate-tomentose. *Sepals* oblong, acute, stellate-tomentose outside, glabrous inside except a tuft of hairs at the base. *Petals* about the size and shape of the sepals, glabrescent, with a fleshy scale at the base and a transverse belt of long hairs above it. *Ovary* sessile, densely villous; style shorter than the ovary, cylindric, expanding upwards into the broad papillose stigma. *Capsule* about .75 in. long and slightly wider, emarginate at the apex and crowned by the persistent style: pericarp leathery, villous and dark-coloured; inside white, shining and glabrous: placentas broad, seeds sessile or shortly stalked, sub-lenticular, the long hairs of the arillus forming a marginal ring. *Bixagrewia nicobarica*, Kurz, Trim. Journ. Bot. for 1875, p. 325, t. 169.

Nicobars: Kurz. Perak; King's Collector, Wray.

The genus *Trichospermum* was founded by Blume for his single species *T. Javanicum*. The generic definition which I have given above differs from that of Blume (Bijdr. 56), in these respects. Blume describes (1) the æstivation of the sepals as imbricate; (2) the style as absent; (3) the stigmas as two and emarginate. The definition also differs from that given by Benth. & Hook. (G. P. i. 236) inasmuch as these authors describe (1) the petals as naked at the base; (2) anthers oblong; (3) style almost none; (4) stigma sessile, retuse; (5) the apex of the capsule produced into a short thick leathery expansion; (6) leaves entire.



9. *ELÆOCARPUS*, Linn.

Trees. *Leaves* simple. *Flowers* usually hermaphrodite, rarely polygamous, in axillary racemes. *Sepals* 5, distinct. *Petals* 5, usually laciniate at the apex, rarely entire, springing from the outside of a cushion-shaped, often 5-lobed torus. *Stamens* usually indefinite, never less than 10, arising from the inside of the torus, and more or less aggregated into groups opposite the petals and alternating with the glands of the torus; anthers innate, linear, opening by a terminal pore. *Ovary* sessile, 2-5-celled, cells 2-many-ovuled; style columnar. *Drupe* with a single bony stone which is 3-5 or, by abortion, 1-celled. *Seeds* pendulous, 1 in each cell, albumen fleshy; cotyledons flat. Distrib. About 50 species chiefly in the Indian Archipelago and India; a few in some of the South Sea Islands, New Zealand, and Australia.

Sect. I. *Ganitrus*. *Ovary* and *drupe* 5-celled, the latter globular.

Leaves glabrescent or glabrous, without stipules.

Leaves lanceolate	...	...	1. <i>E. Ganitrus</i> .
„ ovate-oblong	...	...	2. <i>E. parvifolius</i> .

Leaves softly rusty-pubescent or tomentose beneath, stipulate	..	...	3. <i>E. stipularis</i> .
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Sect. II. *Eu-elæocarpus*. *Ovary* 3-celled: longer cell of anthers usually with an apical tuft of minute hair; petals cuneiform, fimbriate.

Leaves pubescent beneath, elliptic-oblong	...	...	...	4. <i>E. Scortechinii</i> .
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Leaves glabrescent beneath; the midrib pubescent.

Leaves ovate to elliptic-ovate, with black dots beneath	...	...	5. <i>E. Wrayi</i> .
„ narrowly lanceolate, not dotted beneath...	...	...	6. <i>E. salicifolius</i> .

Leaves quite glabrous everywhere.

Leaves with rounded bases.

Petals glabrous	...	...	7. <i>E. robustus</i> .
„ glandular-pubescent	...	...	8. <i>E. nitidus</i> , var. <i>leptostachyus</i> .

Leaves with their bases much narrowed.

Petals glandular-pubescent: fruit ovoid or slightly ob- ovoid, blunt	...	...	8. <i>E. nitidus</i> .
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Petals glabrous except on the  
edges: fruit ovoid-elliptic,  
slightly apiculate ... 9. *E. floribundus*.

Sect. III. *Monocera*. Outer cell of anther  
produced into an awn. Ovary 2-celled.

*Drupe* 1-celled, 1-seeded.

Petals ovate-acuminate, entire ... 10. *E. paniculatus*.

Petals about equally wide at base and  
apex; the apex toothed ... 11. *E. petiolatus*.

Petals wider at the base than the apex,  
the edges much incurved below the  
middle, the apex irregularly toothed  
or fimbriate.

Apex of leaves acuminate.

Racemes longer than the  
leaves: stamens 35 to 40 ... 12. *E. Griffithii*.

Racemes usually shorter than  
the leaves: stamens 20 ... 13. *E. Hullettii*.

Apex of leaves obtuse: stamens  
about 15 ... 14. *E. pedunculatus*.

Petals oblong, slightly obovate, apex ob-  
tuse with 6 to 8 broad teeth ... 15. *E. Kunstleri*.

Petals cuneiform.

Apex of petals with 8 to 10 rather  
broad teeth, sometimes 2-lobed:  
stamens 30 to 50 ... 16. *E. obtusus*.

Petals oblong-cuneiform to cunei-  
form, with numerous fimbriae ... 17. *E. apiculatus*.

Petals broadly cuneiform, lobed and  
fimbriate ... 18. *E. aristatus*.

Sect. IV. *Acronodia*. Flowers 4-merous, poly-  
gamous; anthers not awned and usually  
not bearded (sometimes slightly bearded  
in *E. glabrescens*).

Leaves sparsely and minutely pubescent  
or puberulous beneath, their edges  
serrulate; petals elliptic, the apex  
slightly lobed ... 19. *E. polystachyus*.

Leaves rufous-tomentose beneath, sub-  
glabrescent only when very old,  
edges quite entire, recurved; petals  
oblong, obtuse, 8 to 10-toothed ... 20. *E. Jackianus*.

Leaves rufous-pubescent on lower surface  
when young: ultimately glabrescent  
or glabrous ... .. 21. *E. glabrescens*.

Leaves glabrous at all stages.

Leaves acute narrowed at the base  
into the petiole: fruit oblong-  
ovoid, .5 in. long ... .. 22. *E. punctatus*.

Leaves acuminate (often caudate)  
base not passing into petiole:  
fruit ovoid-globose, .35 in. long... 23. *E. Mastersii*.

1. *ELÆOCARPUS GANITRUS*, Roxb. Hort. Beng. 42: Fl. Ind. iii. 592.  
A tree 30 to 60 feet high: branchlets with dark bark, cinereously puberulous when quite young. *Leaves* membranous, lanceolate, acute at base and apex, obscurely serrulate, glabrescent or glabrous: main nerves 10 to 12 pairs, spreading, slender: length 3.5 to 5.5 in., breadth 1.25 to 2.25 in., petiole .3 to .5 in. *Racemes* from the branches below the leaves, drooping, shorter than the leaves, crowded, many-flowered. *Flowers* .35 in. long, narrow and pointed in bud; their pedicels rather longer, puberulous. *Sepals* lanceolate, shorter than the petals, puberulous outside, glabrescent inside. *Petals* obovoid, the base thickened, rounded and puberulous at the edge; the limb glabrous, lacinate for more than half its length. *Torus* short, fleshy, wrinkled, pubescent. *Anthers* about 30 to 35, sessile, slightly pubescent or glabrous; the cells slightly unequal, the longer with 1 (or sometimes 2) short white terminal hairs. *Ovary* ovoid-conic, with deep vertical grooves, minutely tomentose, 5-celled, each cell with about 4 ovules. *Style* much longer than the ovary, thin, fluted, puberulous or glabrescent, thickened towards the base. *Fruit* spherical, .75 to .9 in. in diam., glabrous, bluish-purple; the stone vertically 5-grooved, tubercled, 5-celled, often only one cell containing a ripe seed. *Mast.* in Hook. fil. Fl. Br. Ind. i. 400; Kurz Fl. Burm. i. 13; Wall. Cat. 2660 A to D; Dalz. & Gibs. Bomb. Fl. 27. *Ganitrus sphaerica*, Gærtn. Fruct. ii. 271, t. 139, f. 6; Wight Ic. i. 66.—Rumph. Amb. iii. t. 101. *E. cyanocarpa*, Maing. in Hook. fil. Fl. Br. Ind. i. 406.

Malacca; Maingay, No. 263. Penang; Curtis. Perak; King's Collector, Soorteohini. Distrib. Java; British India, in damp tropical forests as far west as Nepal.

I have dissected flowers of the type specimen (Maingay No. 263) of *E. cyanocarpa*, Maingay, and I can find no difference in them from those of the type sheets of *E. Ganitrus* in Wall. Cat. Roxburgh's original drawing of *E. Ganitrus* in Herb. Calc. is wrong as regards the petals,

which it represents as too broad and with too many fimbriæ: otherwise it is an equally exact representation of the Indian plant described by him as *E. Ganitrus*, and of *E. cyanocarpa*, Maingay.

2. *ELÆOCARPUS PARVIFOLIUS*, Wall. Cat, 2662 A & B. A tree 30 to 50 feet high: young branches at first minutely pubescent, ultimately glabrous greyish-brown and minutely lenticellate. *Leaves* membranous, ovate-oblong, rather bluntly acuminate, serrulate, the base cuneate: upper surface shining, glabrous; the lower dull of chocolate brown colour, glabrous or glabrescent, the midrib and 5 or 6 pairs of curved ascending nerves pubescent on both; length 2·5 to 4 in., breadth 1·1 to 1·4 in.; petiole ·6 to ·75 in., slender, puberulous. *Racemes* from the branches below the leaves, rather shorter than the leaves, the rachis, flower-pedicels and outside of calyx softly and shortly pubescent. *Flowers* ·3 in. in diam., their pedicels about ·1 in., recurved, buds conical. *Sepals*, slightly shorter than the petals, lanceolate, puberulous within and 3-nerved. *Petals* cuneiform, slightly nerved, cut half-way down into numerous narrow laciniae, almost glabrous. *Torus* of 5 distinct, broad, shallow, fleshy, grooved, pale, velvety glands. *Stamens* 15, shorter than the petals, with short filaments; the anthers scaberulous, cells equal, obtuse, the outer sometimes with 2 or 3 minute pale apical hairs. *Ovary* globose, 5-grooved, 5-celled, sparsely pubescent. *Style* as long as the stamens, cylindric, faintly 5-grooved, glabrescent or glabrous. *Fruit* globose, sometimes ovoid-globose, ·75 to 1 in. in diam.: stone 5-celled, with fertile seeds in only 2 or 3 cells, ovoid, ·7 in. long, bluntly rugose, and with 5 very faint grooves from base to apex. *O.* Mull. Annot. de fam. Elæocarp. 24; Hook. fil. Fl. Br. Ind. i. 401.

Singapore; Ridley, King's Collector. Malacca; Griffith, (Kew Distrib.) 684, Maingay, 254. Penang and Singapore; Wallich, Curtis. Perak; King's Collector, Scortechini.

3. *ELÆOCARPUS STIPULARIS*, Blume Bijdr. 121. A more or less rusty-pubescent tree 40 to 70 feet high: young branches thin, minutely tomentose. *Leaves* coriaceous, ovate to oblong-ovate, acute or acuminate: the edges usually entire, slightly recurved when dry, sometimes waved; the base slightly cuneate, or sometimes rounded: upper surface at first puberulous, ultimately glabrous, the midrib always pubescent: lower softly rusty-pubescent: main nerves 9 to 12 pairs, spreading, interarching close to the margin: length 3·6 to 6·5 in., breadth 1·75 to 2·5 in.; petiole ·5 to ·75 in., minutely tomentose, not conspicuously thickened at the apex; stipules halbert-shaped, tomentose, fugaceous. *Racemes* axillary and from the axils of fallen leaves, usually shorter than, but sometimes as long as the leaves; the rachises, pedicels

and outside of sepals minutely tomentose. *Flowers* .35 in. in diam., their pedicels .2 to .3 in. long; buds sub-globose, obtusely pointed. *Sepals* ovate-lanceolate, pubescent inside especially towards the base, the mid-rib thickened. *Petals* longer than the sepals, cuneiform, lobed and cut irregularly half-way into about 25 slightly unequal fimbriae, veined, glabrous, the edges villous. *Torus* of 5 distinct, fleshy, sub-globose, puberulous, transversely oblong, truncate, 2-grooved glands. *Stamens* 25, about half as long as the petals: filaments about half the length of the scaberulous anthers; cells unequal, the longer with (but sometimes without) an apical tuft of 4 or 5 stiff white hairs. *Ovary* ovoid-globose, vertically 5-furrowed, tomentose, 5-celled. *Style* twice as long as the ovary, conic-cylindric, pubescent at the thickened base, glabrescent above. *Fruit* globose, smooth; .8 to 1 in. in diam.; pulp thin: stone very hard, thick, 1-seeded. *Miq. Fl. Ind. Bat.* i. pt. 2, p. 209; *Mast. in Hook. fil. Fl. Br. Ind.* i. 404; *Kurz Fl. Burm.* i. 170.

Malacca; Griffith, No. 683, Maingay, No. 255, (Kew Distrib.). Singapore, Malacca, Penang, Perak; very common at low elevations. Distrib. Java, Sumatra, Borneo, Burmah.

Var. *latifolia*, King. *Leaves* broadly elliptic to elliptic-oblong 5 to 7 in. long and 2.75 to 3.75 in. broad: petioles elongate, 1.5 to 2.75 in.; stipules lanceolate.

Perak; Scortechini No. 1991, King's Collector, Nos. 4412, 8176, 10786.

4. *ELÆOCARPUS SCORTECHINII*, n. sp. King. A tree 30 to 50 feet high: young branches and stipules as in *E. stipularis*. *Leaves* elliptic-oblong otherwise as in *E. stipularis* except that the main nerves are only 8 to 10 pairs, and the under surface is only softly pubescent, not tomentose: length 5.5 to 7.5 in., breadth 2.25 to 3.25 in. *Flower pedicels* longer than in *E. stipularis*, and the flowers the same, except that the ovary is 3-furrowed and 3-celled. *Fruit* oval, 1 to 1.25 in. long and .5 to .75 in. in diam., glabrous and smooth when ripe, 1-celled, 1-seeded by abortion.

Perak; Scortechini, No. 1481; Wray, Nos. 1876, 1836, 2251; King's Collector, Nos. 3483, 10303.

This is one of the few plants to which the lamented Father Scortechini gave a manuscript name. He dedicated it to Jack: but as Wallich's species, dedicated to the same botanist, has long priority, I name this after my deceased friend. In everything but its 3-celled ovary and smooth oval fruit it agrees with *E. stipularis*, Bl.

5. *ELÆOCARPUS WRAYI*, n. sp., King. A small tree: leaf-buds,

young branches and inflorescence pale tawny-pubescent. *Leaves* ovate to elliptic-ovate, shortly and bluntly acuminate, the margin cartilaginous, sometimes crenate-serrate, the base always entire and rounded; upper surface glabrous, shining: the lower dull, pale but not glaucous, with scattered black dots, glabrescent except the puberulous midrib and 6 or 7 pairs of rather prominent sub-ascending main nerves; the reticulations distinct, wide; length 2.25 to 3.75 in., breadth 1.25 to 1.75 in.; petiole .75 to 1.25 in., pubescent. *Racemes* mostly from the wood below the leaves (a few axillary) more than half as long as the leaves. *Flowers* .2 in. in diam., their pedicels .1 in. long or less: buds ovoid, blunt. *Sepals* lanceolate, sub-acute, outside tomentose, inside pubescent and the midrib thickened; the edges not incurved. *Petals* broadly cuneate, glabrous, cut for a third or a fourth of their length into about 25 narrow fimbriae; the base truncate. *Torus* of 5 distinct, fleshy, oblong, truncate, several-grooved, velvety glands. *Stamens* 20 to 25, shorter than the petals; filaments less than half as long as the minutely scaberulous anthers; cells sub-equal, the longer sometimes with 2 or 3 short white hairs. *Ovary* globose, pointed, grooved, tomentose, 3-celled. *Style* slightly longer than the ovary, conic-cylindric, pubescent at the base, glabrescent above. *Fruit* ovoid-globular, glabrous, slightly rugose, 1 to 1.25 in. long when ripe, and .8 to .9 in. in diam.: pulp rather thin: stone bluntly rugose: putamen very hard, thick: 1 cell with a solitary seed, the other 2 cells abortive.

Perak; on Gunong Bubu at 5000 feet elevation; Wray, No. 3357: Gunong Batu Patch, Wray, No. 1107; Scortechini, No. 400.

This resembles *E. parvifolius*, Wall. in some respects; but its leaves have more rounded bases, their nerves are rather more numerous and the petioles longer; the flower buds are blunt and not pointed as in that species, and they are tomentose rather than pubescent; also the stamens are more numerous and the ovary is 3-celled. This is found moreover at much higher elevations than *E. parvifolius* which is found at elevations under 1000 feet.

6. *ELMOCARPUS SALICIFOLIUS*, n. sp., King. A tree 30 feet high: young branches puberulous. *Leaves* thinly coriaceous, narrowly lanceolate, slightly oblique: acuminate, serrulate-crenulate except at the entire cuneate base; upper surface glabrous, shining, olivaceous when dry, the midrib puberulous; lower dull brown when dry, glabrescent, the midrib puberulous: main nerves about 8 pairs, rather straight, sub-ascending, slender; length 3 to 3.5 in., breadth .7 to .9 in.: petiole about .5 in., puberulous. *Racemes* from the lower axils and from the axils of fallen leaves, nearly as long as the leaves; the slender rachises,

and pedicels pubescent. *Flowers* .25 in. in diam., the pedicels .15 to .2 in. *Sepals* lanceolate, spreading, hoary adpressed-tomentose outside, pubescent inside, the midrib slightly thickened, the edges not incurved. *Petals* a little longer than the sepals, cuneiform, contracted into a rather narrow claw, divided more than half-way down into about eight 3-fimbriate lobes, glabrescent outside, pubescent inside. *Torus* of 5 distinct, subglobose, fleshy, externally grooved glands. *Stamens* 25, shorter than the petals: filaments half as long as the minutely scaberulous shining anthers: cells subequal, pointed, the upper with a minute apical tuft of short hairs. *Ovary* globose, pointed, tomentose, 3-celled. *Style* longer than the stamens, thick and tomentose at the base, cylindric and glabrous above. *Fruit* unknown.

Singapore; King's Collector, No. 1207.

This approaches *E. angustifolius*, Bl. but has smaller more pubescent petals, fewer stamens, and less glabrous leaves. It is also closely allied to *E. hypadenus*, Miq., but has not the characteristic rounded stipules of that species, and the leaf-venation is different. It is also allied to *E. parvifolius*, Wall. from which it differs in its narrower leaves with much more slender veins, and also by its 3-celled ovary.

7. *ELÆOCARPUS ROBUSTUS*, Roxb. Hort. Beng. 42; Fl. Ind. ii. 598. A tree 40 to 60 feet high; young branches rather stout, at first puberulous; afterwards glabrous, cinereous, lenticellate. *Leaves* thinly coriaceous, ovate-lanceolate to ovate, acuminate or acute, serrate almost to the slightly narrowed rounded rarely cuneate base; both surfaces glabrous, the upper shining; the lower dull, slightly paler, the minute reticulations rather distinct and the 10 to 12 pairs of spreading curving nerves rather prominent: length 3.5 to 9 in., breadth 1.75 to 3.5 in.; petiole 1 to 2.25 in., thickened at the apex. *Racemes* from the branches beneath the leaves, and a few axillary, often nearly as long as the leaves: rachis, pedicels and outer surface of the sepals pubescent. *Flowers* .5 in. in diam., the pedicels slightly recurved and about .3 in. long. *Sepals* lanceolate, glabrous inside except the incurved pubescent edges, the midrib thick. *Petals* broadly cuneiform, much contracted in the lower half, the base acute, cut half-way down into about 30 narrow fimbriae, glabrous except the puberulous edges. *Torus* of 5 fleshy, truncate, cushion-like velvety glands. *Stamens* 30 to 50, shorter than the petals, scaberulous; the filaments curved, about one-fifth the length of the anthers; cells subequal, the longer with a small tuft of white hair at its apex. *Ovary* ovoid-globose, with about 6 shallow vertical grooves, tomentose, 3-celled. *Style* cylindric, longer than the ovary, shorter than the petals, pubescent in its lower, glabrous

in its upper half. *Fruit* ovoid-globose, 1 to 1.25 in. long : stone oblong-ovoid, rugose, slightly 3-grooved at base and apex, 3-celled. *Mast.* in Hook. fil. Fl. Br. Ind. i. 402; Kurz Fl. Burm. i. 169; Pierre Fl. For. Coch-Chine, t. 147; Wight Ic. t. 64; Wall. Cat. 2664. *E. ovalifolius*, Wall. Cat. 2665; C. Müll. Annot. de fam. Elæocarp. 21. *E. amygdalinus*, Wall. Cat. 6857. *E. serratus*, Wall. Cat. 2666 C. *E. oblonga*, Wall. Cat. 2677. *E. aristatus*, Wall. Cat. 2665 B. ? Wall. Cat. 9027. *E. Helferi*, Kurz MSS.; Hook. fil. Fl. Br. Ind. i. 402.

Penang; Curtis. Pahang; Ridley. Andaman Islands. Distrib. British India, from Burmah to the tropical forests of the E. Himalaya.

8. *ELÆOCARPUS NITIDUS*, Jack Mal. Misc. Vol. i. No. 2, 41; Hook. Bot. Misc. ii. 84. A tree 25 to 35 feet high; young shoots deciduously pulverulent-pubescent, speedily glabrous as are all other parts except the inflorescence; young branches with blackish bark. *Leaves* thinly coriaceous, oblong-lanceolate to elliptic-oblong, acuminate, crenate-serrulate, (sometimes obscurely so) the base cuneate (rounded in var. *leptostachya*); upper surface shining, the lower dull brown; main nerves 10 to 13 pairs, spreading, forming slender arches a little short of the margin: length 4.5 to 9 in., breadth 1.75 to 2.75 in.; petiole 1.25 to 2 in. thickened at the apex. *Racemes* crowded on the old wood below the leaves and rather more than half as long; rachis, flower-pedicels, and exterior of sepals sparsely puberulous. *Flowers* .35 in. in diam., their pedicels recurved and rather shorter. *Sepals* shorter than the petals, ovate-lanceolate, acute, puberulous and sometimes lenticellate outside, puberulous inside and the midrib very thick. *Petals* cuneiform, finely and irregularly laciniate for nearly half their length, the entire triangular part with thickened nerves and truncate base, glandular-pubescent especially at the edges. *Torus* of 5 truncate, sub-globular, fleshy, tomentose, cushion-like glands. *Stamens* 15 to 35; the filaments nearly as long as the scabrid obtuse anthers: cells sub-equal, awnless, but sometimes the longer with 2 or 3 small white hairs. *Ovary* globose, slightly pointed, tomentose, 3-celled; style longer than the ovary, slightly thickened below and puberulous. *Fruit* ovoid, or slightly obovoid, smooth, 1.5 in. long, and 1 in. in diam. when quite ripe: stone 3-celled, only one cell bearing a perfect seed. Wall. Cat. 2670; Miq. Fl. Ind. Bat. i. pt. 2, p. 208; Mast. in Hook. fil. Fl. Br. Ind. i. 401; Wall. Cat., No. 2678 (*E. pedunculatus*) in part.

Penang; Jack, Curtis, No. 282, 463. Perak; King's Collector, No. 4926.

The anthers are sometimes without any terminal hairs: sometimes there are a few. I have seen no authentic specimen of Jack's naming,



and nothing that I have dissected quite fits his description of *E. nitidus*, of which he describes the stamens as 15: whereas in the plants which I refer to this species they vary from 15 to 35. Jack describes the putamen as 5-ridged and 5-celled: I do not find more than 3 cells in the ovary. In spite, however, of these discrepancies, I believe that Jack's specimen above cited belongs to the species which he named *E. nitidus*. Wallich's specimen No. 2679 has leaves which do not well answer to Jack's description "attenuate at the base." They are only slightly attenuate, and correspond rather with those of his own species *E. leptostachyus* which is sufficiently distinct as regards the shape of its leaves to be maintained as a variety, though not in my opinion entitled to specific rank.

Var. *leptostachya*. Leaves elliptic-oblong to elliptic-rotund, acute, the edge obscurely serrate-crenate, often sub-entire, the base rounded: length 6 to 9 in., breadth 2·75 to 4·5 in.; petiole 1 in. to 1·75 in., slightly thickened at the apex. *E. leptostachyus*, Wall. Cat. 2672; C. Müll. Annot. de fam. Elæocarp. 23; Mast. in Hook. fil. Fl. Br. Ind. i. 403.

Penang, Wallich; Perak; King's Collector, Nos. 409, 4905, 10105, 10240; Scortechini, Nos. 195, 1752; Wray, No. 2313.

9. *ELÆOCARPUS FLORIBUNDUS*, Blume Bijdr. 120. A tree 30 to 40 feet high: young shoots shortly silky; otherwise glabrous, except the inflorescence. Leaves thinly coriaceous ovate-elliptic to oblong-lanceolate or oblanceolate, shortly acuminate, coarsely crenate-serrate, the base much narrowed; both surfaces shining, with a blistered appearance when dry: main nerves 5 to 7 pairs; length 3 to 5·5 in., breadth 1·75 to 2·75 in., petiole 1 to 1·5 in., thickened at the apex. Racemes usually from below the leaves, sometimes axillary, usually shorter than, but sometimes nearly as long as the leaves; rachises, pedicels and outside of sepals puberulous. Flowers 4 in. in diam., their pedicels about 35 in. long. Sepals lanceolate, outside glabrescent and often pustulate; inside glabrous except the pubescent involute edge, the midrib prominent. Petals cuneiform, lobed irregularly half-way down, the lobes divided into about 25 fimbriæ, glabrous except the pubescent edges, the lower half veined and thickened, often pustulate. Torus of 5 distinct, fleshy, oblong, subglobular, truncate, tomentose glands. Stamens about 30, shorter than the petals, scaberulous, the filaments very short, the cells slightly unequal, the longer with a small apical tuft of white hair. Ovary ovoid-globose, tomentose, 3-celled. Style longer than the stamens, cylindric, puberulous in the lower, glabrous in the upper third. Fruit 1 in. long, ovoid-elliptic and slightly apiculate when ripe, oblong and much apiculate when young: stone narrowly ovoid tapering to each end, with 3 vertical grooves and many rather shallow large rugæ, 3-celled, one

or two of the cells sub-abortive, the walls thick. Mast. in Hook. fl. Fl. Br. Ind. i. 401; Miq. Fl. Ind. Bat. i. pt. 2, 210; Kurz Fl. Br. Barm. i. 167; Pierre Fl. Forest. Coch.-Chine, t. 143; Miq. Fl. Ind. Bat. i. pt. 2, 210. *E. serratus*, Roxb. (not of L.) Fl. Ind. ii. 596. *E. grossa*, Wall. Cat. 2661. *E. serratus*, Roxb. ex Wall. Cat. 2666 A, B. partly. *E. oblongus*, Wall. Cat. 2677; C. Müll. Annot. de fam. Elæocarp. 19, f. 30. *E. Lobbianus*, Turcz. in Mosc. Bull. 1858, 235.

The Nicobar Islands. Distrib. British India through Burmah to the E. Himalaya, in tropical forests.

There is no doubt that this is the plant which Roxburgh described as *E. serratus*, Willd.

10. *ELÆOCARPUS PANICULATUS*, Wall. Cat. 2663. A tree 15 to 30 feet high: all parts glabrous except the inflorescence, young branches with dark polished bark. *Leaves* thinly coriaceous, lanceolate or oblanceolate-oblong to ovate-oblong, shortly acuminate; the edges entire, slightly wavy; base slightly cuneate, sometimes rounded: both surfaces glabrous, the upper shining; the lower paler and rather dull, the reticulations distinct; main nerves 5 to 7 pairs, sub-ascending, inter-arching freely within the margin: length 4.5 to 6.5 in., breadth 1.65 to 2.75 in.; petiole .8 to 2 in., glabrous. *Racemes* numerous, from the axils near the apices of the branches, longer than the leaves, erect, rachises puberulous, becoming glabrous: pedicels spreading, slender, minutely pubescent, .5 to .65 in. long. *Flowers* about .5 in. in diam.; buds ovoid with long narrow points. *Sepals* ovate, acuminate, adpressed-sericeous outside; glabrous inside except the pubescent infolded edges. *Petals* not longer than the sepals, ovate acuminate, entire, outside adpressed-sericeous, inside glabrous in the upper villous in the lower half and especially on the thickened midrib and infolded edges. *Torus* a shallow fleshy waved sericeous disk. *Stamens* 50, almost sessile, nearly as long as the petals; anthers sericeous, the cells sub-equal, the outer with a rather thick terminal awn. *Ovary* narrowly ovoid, sericeous, 2-celled. *Style* longer than the ovary, cylindric, glabrous. *Fruit* ellipsoid, blunt at each end, smooth, glabrous, bluish when ripe, .4 to .5 in. long and .25 to .35 in. in diam.; pulp rather thick, slightly fibrous; stone bony, minutely tuberculate, 1-celled, 1-seeded. C. Müll. Annot. de fam. Elæocarp. 12; Mast. in Hook. fl. Fl. Br. Ind. i. 407. *Monoceras leucobotryum*, Miq. Fl. Ind. Bat. Suppl. 409. *Monocera Griffithii*, Müll. l. c.

Singapore; Wallich, Anderson. Malacca; Griffith, Maingay (Kew Distrib.) No. 257. Perak; Scortechini, King's Collector; common at low elevations.

11. *ELMOCARPUS PETIOLATUS*, Wall. Cat. 2673. A tree 20 to 40 feet high; all parts glabrous except the inflorescence; young branches dark-coloured, about the thickness of a goose-quill. *Leaves* coriaceous, elliptic to elliptic-oblong, acute or shortly and bluntly acuminate; edges entire: base slightly cuneate or rounded; both surfaces shining, the lower slightly paler when dry, the reticulations sharply distinct on both surfaces: main nerves 7 or 8 pairs, sub-ascending, curving and interarching a little within the margin: length 4·5 to 6·5 in., breadth 2 to 2·75 in.; petiole 1·4 to 2·4 in. slender, dark-coloured, slightly thickened at the apex. *Racemes* numerous from the old wood just below the leaves, shorter than the leaves, rachises and pedicels deciduously puberulous. *Flowers* .5 in. in diam., their pedicels .35 in.; buds ovoid, rather abruptly pointed. *Sepals* lanceolate, acuminate, almost glabrous externally; quite glabrous internally, the infolded edges alone pubescent, the midrib thickened from base to apex. *Petals* about as long as the sepals, oblong, the apex cut into 10 to 13 narrow glabrous teeth, the lower two-thirds sericeous, cucullate at the base from the infolding of the edges, a large fleshy villous gland in the middle near the base with a quasi-cell at each side of it, the hairs on the inner surface retroversed. *Torus* a 10-lobed fleshy glabrescent disk. *Stamens* 18 to 25, shorter than the petals, with sericeous or glabrescent flat or sub-cylindric filaments much shorter than the shortly puberulous anthers: apex of anther deeply cleft, the outer cell with a sub-recurved thick awn shorter than the filament. *Ovary* ovoid, pointed, glabrous, 2-celled. *Style* as long as the stamens and much longer than the ovary, cylindric, grooved, glabrous. *Fruit* elliptic, blunt at each end, smooth, .4 to .6 in. long, and .3 in. in diam.: the pulp thin, with very few fibres; stone very slightly rugose, 1-celled, 1-seeded. *Monocera petiolata*, Jack Mal. Misc. i. No. v, 43; ex Hook. Bot. Misc. ii. 86; Cum. et Zoll. in Bull. Mosc. xix, 495. *Monoceras petiolatum*, Miq. Fl. Ind. Bat. i. pt. 2, p. 212; Kurz Fl. Burm. i. 164; Pierre, Fl. Forest. Coch.-Chine, t. 140. *Elæocarpus integra*, Mast (not of Wall.) in Hook. fil. Fl. Br. Ind. i. 408.

Malacca; Griffith No. 699; Maingay, No. 256, (Kew Distrib.); Derry. Singapore; Hullett, King. Penang; Curtis, No. 333. Perak; Scortechini, King's Collector, Wray, very common at low elevations. Distrib. Sumatra, Beccari, N. S. No. 668.

This is undoubtedly the *Monocera petiolata* of Jack; that it is the *Elæocarpus integra* of Wall. (Cat. No. 2668) I very much doubt. Wallich's No. 2668 was collected in Silhet from which no specimen anything like this has been collected since his day. In fact there is no evidence to show that this species is found in any part of British India (as distinguished from British Malaya), although Kurz includes it in his

**Flora of Burmah.** This species is a smaller tree than *E. pedunculatus*, which, however, it closely resembles, differing chiefly in the shape of the leaves, the nearly glabrous sepals and in the larger number of stamens. *E. ovalis*, Miq. (a species from Sumatra) must be very nearly allied to this. I have seen only a fruiting specimen of *E. ovalis*, but, except in having leaves of thicker texture and slightly larger fruit, I see little to prevent its being referred here.

12. *ELÆOCARPUS GRIFFITHII*, Mast. in Hook. fil. Fl. Br. Ind. i. 408. A tree 30 to 40 or over 70 feet high, all parts glabrous except the inflorescence; young branches almost as thin as a crow-quill, dark-coloured. *Leaves* thinly coriaceous, ovate-lanceolate to lanceolate, acuminate, the edges cartilaginous with shallow mucronate crenulations, or subentire with remote marginal black points, the base sub-cuneate or rounded: both surfaces shining, the reticulations minute and distinct: main nerves 5 or 6 pairs spreading, forking and interarching at some distance from the margin, not prominent: length of blade 2·5 to 3·75 in., breadth ·9 to 1·5 in., petiole ·5 to 1 in. *Racemes* from the upper axils, longer than the leaves, rachises and pedicels softly and minutely pubescent. *Flowers* ·5 in. in diam.; pedicels thickened at the apex, ·6 to ·8 in long: buds ovoid-conic. *Sepals* lanceolate, acuminate, finely adpressed sericeous externally, glabrous internally except the pubescent infolded edges and the thickened sometimes sericeous midrib. *Petals* about as long as sepals, ovate, acuminate, the apex irregularly 2 or 3-toothed with 2 or 3 lateral fimbriæ, outside minutely adpressed-sericeous, inside retroversed hirsute especially on the large gland near the base; edges in the lower two-thirds much infolded so as to form with the gland 2 quasi-cells. *Torus* a shallow, acutely 10-lobed, fleshy disk. *Stamens* 35 to 40, shorter than the petals: filaments short, sericeous as are the unequally 2-celled anthers: outer cell with a tapering awn  $\frac{1}{4}$  to  $\frac{1}{3}$  of its own length, the inner with a few apical hairs. *Ovary* narrowly ellipsoid, tapering, glabrous except a few silky hairs, 2-celled. *Style* cylindric, grooved, glabrous, longer than the ovary. *Fruit* ellipsoid, blunt at both ends, smooth, ·5 in. long and ·3 in. in diam.: pulp thin with a few fibres; stone slightly rugose, 1-celled, 1-seeded. Kurz in Journ. As. Soc. Beng. pt. 2, for 1870, p. 68; for 1874, pt. 2, 123; For. Flora Burm. i. 164. *Monocera tricanthera*, Griff. Not. pt. 4, 518, t. 619, fig. 3. *Monocera Griffithii*, Wight Ill. i. 84, (not of Müll.). *Monocera holopetala*, Zoll. et Cum. Bull. Mosc. xix, 496. *Monoceras odontopetalum*, Miq. Fl. Ind. Bat. Supp. 409.

Malacca; Griffith, Maingay, No. 257/2 (Kew Distrib.). Porak, at low elevations; King's Collector, Wray. Penang; King's Collector. Distrib. Tenasserim, Helfer, No. 714, Kew Distrib.

13. *ELÆOCARPUS HULLETTII*, n. sp., King. A tree 30 to 40 feet high: young branches very slender, dark-coloured; all parts glabrous except the inflorescence. *Leaves* thinly coriaceous, lanceolate to ovate-lanceolate, acuminate; edges slightly cartilaginous, entire or remotely and obscurely serrate; the base cuneate or rounded: both surfaces shining, the reticulations minute, elongate and rather distinct on the lower; main nerves 7 or 8 pairs curving, interarching within the edge, rather faint; length of blade 2·5 to 3 in., breadth ·75 to 1·4 in.; petiole ·65 to ·9 in., slender. *Racemes* from the leaf-axils below the apex, crowded, usually shorter than, but sometimes as long as, the leaves, the rachises glabrescent or puberulous, the pedicels silky puberulous. *Flowers* ·3 in. in diam., their pedicels ·35 in. long. *Sepals* linear-lanceolate, acuminate; externally adpressed-pubescent; internally glabrous below, puberulous near the apex and on the infolded edges. *Petals* ovate, concave at the base, narrowed to the 10 to 12-fimbriate apex; outside glabrous, inside villous on the much-thickened base of the midrib, otherwise puberulous. *Torus* very shallow, deeply 10-lobed, sericeous. *Stamens* 20, slightly shorter than the petals: filaments nearly as long as the minutely scaberulous anthers, outer cell with tapering awn nearly as long as itself. *Ovary* ovoid, pubescent, 2-celled. *Style* as long as the petals and much longer than the ovary, subulate, puberulous below, glabrous above. *Fruit* ellipsoid, blunt at each end, smooth, ·6 in. long, ·35 in. in diam.; pulp thin, very slightly fibrous: stone rugulose, rather thick, bony, 1-celled, 1-seeded.

Singapore; Hullett, No. 132. Penang; Curtis, No. 1091, King's Collector, No. 1475. Perak, on low hills; Scortechini, King's Collector.

A species not unlike *E. Griffithii*, Wall. but with smaller flowers and much shorter racemes.

14. *ELÆOCARPUS PEDUNCULATUS*, Wall. Cat. 2678 in part. A tree 40 to 80 feet high: glabrous except the inflorescence: young branches nearly as thin as a crow-quill, polished, dark-coloured; their apices and the older branchlets rough and thickened. *Leaves* coriaceous, oblanceolate or narrowly elliptic-oblong, obtuse or slightly narrowed at the apex, the base very cuneate; the edges cartilaginous, remotely-mucronate crenate-waved, slightly recurved when dry: both surfaces shining: the lower very slightly the paler and with the minute reticulations distinct; main nerves 5 to 7 pairs, interarching at some distance from the edge; length of blade 3 to 4·5 in., breadth 1·25 to 1·8 in., petiole ·75 to 1·2 in. *Racemes* axillary but mostly from axils of fallen leaves, 3 or 4 in. long, rachises and pedicels hoary-pubescent. *Flowers* ·3 in. in diam., buds narrowly ovoid, sub-acute; pedicels recurved, slightly longer than the

flowers. *Sepals* lanceolate<sup>\*</sup>, sub-acute, minutely adpressed-sericeous externally, almost glabrous internally except the pubescent inverted edges, the midrib equally thickened from base to apex. *Petals* slightly longer than the sepals, oblong, expanded at the base, the apex broad, cut into 10 to 15 cylindric filiform glabrous fimbriæ one-fourth of the length of the petals; lower part sericeous on both surfaces but especially on the inner (where the hairs are reversed), cucullate with the edges much infolded, and with a large basal gland at each side of which is an imperfect cell. *Torus* a fleshy deeply 10-lobed glabrescent disc. *Stamens* about 15; slightly shorter than the petals, filaments pubescent, less than half the length of the puberulous sub-equal anthers: outer cell with a short sub-recurved awn. *Ovary* ovoid, pointed, smooth, glabrous, 2-celled. *Style* as long as the stamens, cylindric, grooved, glabrous. *Fruit* ellipsoid, blunt at each end, .5 in. long and .3 in. in diam., 1-celled, 1-seeded; pulp rather thin, slightly fibrous, stone minutely rugulose, 1-celled, 1-seeded. *Mast.* in Hook. fil. Fl. Br. Ind. i. 408.

Singapore; Wallich, Ridley, Malacca; Griffith, No. 698, Maingay No. 258 (Kew. Distrib.). Penang; Curtis, No. 256. Perak; Scortechini, King's Collector, Nos. 269, 6907, 10831.

Miquel's *Monocera Palembangica*, from Sumatra, judging from the only authentic specimen which I have seen (and which has no flowers), if not identical with this must be a very closed allied species. Under his Catalogue, No. 2678, Wallich issued two species, the above described as *E. pedunculatus*, and another which is clearly *E. nitidus*, Jack.

15. *ELÆOCARPUS KUNSTLERI*, n. sp., King. A tree 50 to 70 feet high: young branches as thick as a goose-quill, polished, thickened and rough at the apex: all parts glabrous except the inflorescence. *Leaves* coriaceous, rotund-obovate, the apex broadly obtuse, sometimes with a short broad apiculus, rather abruptly narrowed from below the middle to the acuminate base; both surfaces, shining, glabrous; main nerves about 10 pairs, ascending, interarching freely inside the entire or crenate-serrate edge: prominent beneath; the reticulations rather faint; length 5 to 8 in., breadth 2.75 to 3.75 in., petiole .5 to .7 in., pubescent. *Racemes* crowded from the axils of fallen leaves and a few axillary, less than half as long as the leaves, 6 to 9-flowered: rachises and pedicels slender, puberulous, glabrous when old. *Flowers* .6 in. in diam., their pedicels .5 in. or more long. *Sepals* lanceolate, sub-acute, pubescent on both surfaces, the midrib thickened and villous at the base inside. *Petals* about as long as the sepals, oblong slightly obovate, obtuse, thickened in the lower half, the apex with 6 to 8 rather broad teeth, adpressed-sericeous outside, densely villous inside. *Torus* a shallow

toothed villous cup. *Stamens* 28 to 30, shorter than the petals; filaments nearly as long as the minutely scaberulous anthers, swollen in the lower half, the apex of the outer anther-cell with a short recurved awn. *Ovary* ovoid, pointed, tomentose, 2-celled. *Style* cylindric, as long as the petals, puberulous below, glabrous at the apex. *Fruit* unknown.

Perak; at elevations under 1000 feet, King's Collector, No. 8328.

A species near *E. apiculatus*, Mast. but with broader, blunter leaves more abruptly attenuated to the base and quite glabrous, also with smaller flowers.

16. *ELÆOCARPUS OBTUSUS*, Blume Bijdr. 125. A tree 30 or 40 feet high: young shoots minutely pale pubescent, ultimately glabrous. *Leaves* coriaceous, oblong-obovate, the apex rounded or retuse, gradually narrowed from above or below the middle into the acute or acuminate base; the edges sub-entire or with shallow mucronate crenations; upper surface glabrous, shining; the lower minutely puberulous at first, ultimately glabrous, the reticulations very minute and rather distinct; main nerves 6 to 8 pairs, sub-ascending, not much curved, rather prominent below, scrobiculate at their origin from the midrib; length 4·5 to 6·5 in., breadth 2·25 to 2·75 in., petiole ·75 to 1·1 in. *Racemes* axillary, sometimes from the axils of fallen leaves, less than half as long as the leaves, few-flowered; rachises and pedicels puberulous when young, often nearly glabrous when old. *Flowers* ·9 in. in diam; their pedicels slender, ·75 to 1 in. long. *Sepals* oblong-lanceolate, outside minutely pubescent, inside sparsely adpressed-sericeous, the midrib thickened. *Petals* longer than the sepals, cuneiform, the base rather broad; the lower third thickened and its edges infolded, the apex with 8 to 10 rather broad teeth sometimes 2-lobed, sericeous on both surfaces but especially on the thickened lower third. *Torus* a wavy, sub-10-toothed, fleshy, sericeous cup. *Stamens* 30 to 50, shorter than the petals: the filaments slender, slightly swollen in the lower half, as long as the pubescent anthers; outer anther cell with a thin tapering awn about as long as itself. *Ovary* ovoid, sericeous or pubescent, 2-celled. *Style* tapering, cylindric, nearly as long as the petals, slightly grooved, puberulous. *Fruit* ovoid, oblong, not pointed, 1·5 in. long, and ·9 in. in diam., smooth: stone boldly tuberculate, 1-celled, 1-seeded. *Monoceras obtusum*, Hassk. Tijds. Nat. Gesch. xii. 136; Miq. Fl. Ind. Bat. i. pt. 2, p. 212. *E. Monoceras*, Cav. (fide Mast. in Hook. fil. Fl. Ind. i. 405). *E. littoralis*, Kurz (not of Teyssm. and Biun.) in Journ. As. Soc. Beng. 1874, pp. 132, 182; For. Fl. Burm. i. 167.

Malacca; Griffith, (Kew Distrib.) No. 700. Perak, at low elevations; King's Collector, Nos. 1096, 4671; Scortechini 1396. Pahang; Ridley, 1312. Distrib. Java, Borneo, Sumatra, Burmah.

*E. Monoceras*, Cav. to which Dr. Masters reduces this, was founded by its author on specimens from the island of Luzon. The species, however, is not given in the latest Flora of the Philippines (that of Sig. Vidal); and, as the original description of Cavanilles does not quite agree with the flowers of the Perak specimens, I think it safer not to go farther back than Blume's name, leaving it to be settled hereafter whether *E. obtusus*, Bl. is really the same plant as the Philippine *E. Monoceras*. The Perak plant is closely allied to *E. littoralis*, T. B. (for which Kurz mistook it); and also to the smaller-flowered Sumatran *E. cuneifolius*, Miq.

17. *ELÆOCARPUS APICULATUS*, Mast. in Hook. fil. Fl. Br. Ind. i. 407. A tree 50 to 60 feet high: young branches glabrous, their apices much thickened, rough and puberulous. *Leaves* coriaceous, obovate or oblanceolate-oblong, slightly narrowed to the obtuse, sub-acute, or shortly apiculate apex, and much narrowed to the base, the edges sub-entire or with coarse shallow crenations; both surfaces glabrous, shining, the midrib on the lower glabrescent when young; under surface pale, the reticulations minute, rather distinct; main nerves 12 to 14 pairs, slightly prominent beneath and interarching freely within the margin, not scrobiculate; length 7 to 10 in.; breadth 2·5 to 3·75 in., petiole ·3 to 1 in., thickened at the apex. *Racemes* few, mostly from the axils of fallen leaves, usually about a fourth but sometimes half the length of the leaves; the rachises and pedicels softly pubescent. *Flowers* ·9 in. in diam.; buds oblong, sub-obtuse or pointed, their pedicels ·75 to 1·25 in. *Sepals* oblong-lanceolate, rufous-pubescent outside, glabrous or glabrescent inside, the edge infolded and pubescent, the midrib thickened from base to apex. *Petals* slightly longer than the sepals, oblong-cuneiform to cuneiform, cut from one-fourth to one-fifth of their length into numerous rather broad fimbriæ; externally adpressed-sericeous in the lower half, glabrous in the upper; internally thickened and villous in the lower, glabrous in the upper, half. *Torus* a shallow fleshy puberulous cup. *Stamens* 30 to 40, half as long as the petals; filaments shorter than the minutely scaberulous anthers, bulbous at the base: outer anther-cell with short or long apical recurved awn. *Ovary* ovoid, rufous-tomentose, pointed, 2-celled. *Style* as long as the petals, conic-cylindric and pubescent in the lower half, filiform and glabrous in the upper. *Fruit* (fide Masters) "1 in. long, resembling the fruit of a *Diospyros*." *Terminalia moluccana*, Wall. (not of Lamk.) Cat. 3969.

Penang; Wallich. Malacca; Griffith, Maingay, No. 262 (Kew. Distrib.). Perak; Scortechini, King's Collector; common at low elevations.



Allied to *E. Kunstleri*, King and to *E. rugosus*, Roxb. In fact I am inclined to believe that it is merely a form of the latter, from which it should not be separated specifically. Dr. Prain has called my attention to Wallich's sheet No. 3969, which is unmistakeably this species, and has nothing to do with *Terminalia moluccana*, Lamk. which is *T. Cutappa*, Linn.

18. *ELÆOCARPUS ARISTATUS*, Roxb. Hort. Beng.: Fl. Ind. ii. 599. A tree 30 to 60 feet high: young branches of about the thickness of a swan's quill, smooth, thickened and rough towards the apex. *Leaves* thinly coriaceous, obovate, shortly and bluntly apiculate, remotely crenate-serrate, narrowed to the base, glabrous on both surfaces; main nerves 7 to 10 pairs, slender, curving, scrobiculate at the origin from the midrib; length 6 to 8·5 in., breadth 2·75 to 3·75 in., petiole ·5 to ·7 in. *Racemes* axillary and from the axils of fallen leaves, often nearly as long as the leaves, 3 to 5-flowered, rachises and pedicels puberulous or glabrous. *Flowers* nearly 1 in. in diam.; buds cylindric, pointed; pedicels ·8 to 1·25, or longer in fruit. *Sepals* as in *E. apiculatus*. *Petals* also as in *E. apiculatus* but broadly cuneiform, and lobed as well as fimbriate. *Stamens* 50, otherwise as in *E. apiculatus*. *Ovary* less velvety, but otherwise as in *E. apiculatus*. *Fruit* ovoid, smooth, 1·25 to 1·4 in. long and ·8 to ·9 in. in diam., pulp rather thick; stone oblong, flattened, pointed at each end, rugose, slightly ridged in the middle of each side, 1 in. long, 1-celled, 1-seeded. *Mast.* in Hook. fil. Fl. Br. Ind. i. 405. *E. rugosus*, Wall. Cat. No. 2659 (not of Roxb.).

Andaman Islands; King's Collector. *Distrib.* Brit. India in Burmah, Chittagong, Sylhet, Assam, Khasia Hills and base of Eastern Himalaya.

This is very closely allied to *E. rugosus*, Roxb.—a species originally discovered by Roxburgh in Chittagong, but specimens of which from that province are very rare in collections. The plants distributed under this name by Wallich as No. 2659 of his Catalogue were not collected there but in Sylhet, while some of them were taken from trees cultivated in the Botanic Garden, Calcutta. They are not *E. rugosus* at all, but *E. aristatus*, Roxb.; and they differ from true *E. rugosus* in having their young branches thinner and smoother; and in leaves which are always glabrous, not so gradually narrowed to the base and with much longer petioles. Their racemes are also more numerous, the petals more broadly cuneiform and the stamens more numerous, (50 as against 30 to 40). The pulp of the fruit is thicker in Andamans specimens of this than in those from Sylhet and Assam; and the stone is proportionately smaller. There is in Assam and Burmah a plant closely allied to this which has

smaller leaves with very large scrobiculæ on the lower surface at the junction of the petioles with the midrib. This has been named *E. simplex* by Kurz, (Fl. Burm. i. 165.) A similar form occurs in Travancore and has been named *E. venustus* by Beddome (Flora Sylvatica, t. 574).

19. *ELÆOCARPUS POLYSTACHYUS*, Wall. Cat. 2671. A small tree: young shoots rather stout, minutely tawny-tomentose. *Leaves* coriaceous, pale when dry, elliptic to elliptic-oblong, abruptly and shortly acuminate; the edges rather remotely serrulate except at the base, sub-entire when old; the base broad, rounded; upper surface glabrous; the lower sparsely and minutely sub-adpressed puberulous, the midrib pubescent, main nerves 7 to 10 pairs, ascending, curving, prominent beneath, the reticulations minute, faint: length 5·5 to 7·5 in., breadth 2·25 to 3·5 in.; petioles 2·5 to 4 in., minutely tawny-tomentose, slightly thickened at the apex. *Racemes* slightly longer than the petioles; the rachises, pedicels and outside of sepals densely minutely tawny-tomentose. *Flowers* 35 in. in diam., their pedicels 4 in., recurved, buds sub-globose. *Sepals* ovate, acute; inner surface glabrous, except the pubescent edges, the midrib thickened. *Petals* elliptic, little longer than the sepals, the apex obtuse, sometimes slightly lobed, not fimbriate: villous on both surfaces, the hairs on the inner reversed. *Torus* of 5 retuse thin densely villous glands. *Stamens* half as long as the petals: filaments nearly as long as the hispid-pubescent anthers; cells subequal, awnless, beardless. *Ovary* ovoid, blunt, densely villous, 2-celled. *Style* about as long as the ovary, puberulous. *Fruit* oblong, blunt, 6 in. long and 35 in. in diam., smooth, glabrous; stone minutely but sharply rugose, 1-celled, 1-seeded, pulp thin and slightly fibrous. C. Müll. Annot. de fam. Elæocarp. 20, f. 13; Mast. in Hook. fil. Fl. Br. Ind. i. 403.

Singapore; Wallich, Hullett, Ridley. Malacca; Maingay, Nos. 264, 266, (Kew Distrib.).

20. *ELÆOCARPUS JACKIANUS*, Wall. Cat. 2679. A tree 40 to 80 feet high: young branches stout, densely rufous-tomentose. *Leaves* coriaceous, ovate-oblong to elliptic, rarely oblong-ovoid, shortly acuminate or acute, edges entire, recurved; the base rounded or slightly narrowed: upper surface rather dull and pale when dry; glabrous, the midrib alone sometimes pubescent, the lower softly rufous-tomentose, becoming sub-glabrescent when very old, the minute reticulations distinct; main nerves 8 to 10 pairs, sub-ascending, curving, prominent on the lower, impressed on the upper, surface: length 4 to 7·5 in., breadth 2·5 to 4·5 in.; petiole 1·75 to 3 in., stout, thickened at each end, tomentose. *Racemes* crowded on the branches below the leaves, sometimes

axillary, shorter than the petioles, the rachises pedicels and outside of sepals softly rufous-tomentose. *Flowers* 25 in. in diam.; their pedicels about 25 in. long, recurved. *Sepals* 4, ovate, acute; inside puberulous with infolded tomentose edges, the midrib thickened. *Petals* 4, very little longer than the sepals, oblong, slightly obovate, obtuse, shortly 8- to 10-toothed, villous outside, glabrescent inside, the edges villous. *Torus* a shallow rufous-villous cup. *Stamens* about 12, shorter than the petals, scaberulous, the filaments about half as long as the anthers; anther-cells slightly unequal, pointed, the longer sometimes with, but usually without, a minute tuft of white hair. *Ovary* (absent in most flowers) ovoid-oblong, glabrous, imperfectly 2-celled, one cell only perfect. *Fruit* ovoid, tapering at each end, smooth, shining; pulp thin, slightly fibrous: stone sharply rugulose, crustaceous, 1-celled. 1-seeded. *Monocera ferruginea*, Jack Mal. Misc. ex Hook. Bot. Misc. ii. 86.

Singapore; Jack, Kurz. Penang; Curtis, No. 465. Malacca; Griffith, No. 693; Maingay, No. 259, (Kew Distrib.). Perak; King's Collector; common at low elevations.

This species approaches *E. glabrescens*, Mast. but is larger in all its parts and much more persistently tomentose. This is unrepresented by any Wallichian specimen at Kew, and is therefore referred to by Masters in the *Flora of Brit. India* only in a note (i. 409).

21. *ELÆOCARPUS GLABRESCENS*, Mast. in Hook. fil. Fl. Br. Ind. i. 403. A tree: young branches and petioles densely rufous-tomentose. *Leaves* coriaceous, ovate to ovate-lanceolate, acuminate; edges entire, slightly revolute; base rounded or slightly narrowed; upper surface glabrous, the midrib pubescent; lower surface at first rufous-pubescent ultimately glabrescent or glabrous, the reticulations minute but distinct: main nerves 5 or 6 pairs, prominent beneath, spreading, curved: length 2.5 to 3.5 in., breadth 1.2 to 1.6 in.; petiole 1.25 to 1.75 in., slightly thickened at the apex, glabrescent when old. *Racemes* rather longer than the petioles, axillary and from the axils of fallen leaves; rachises and pedicels sparsely pubescent. *Flowers* 25 in. in diam., the pedicels about 2 in. long, recurved. *Sepals* 4, sub-erect, ovate-lanceolate, thickened at the base, pubescent outside, glabrescent inside with puberulous edges, the midrib thickened. *Petals* 4, slightly longer than the sepals, oblong, the apex obtuse and with 6 to 12 short unequal teeth: pubescent outside, glabrescent inside, the edges shortly villous. *Torus* a very shallow villous cup. *Stamens* 10 or 12, shorter than the petals: filaments short: anthers scaberulous, the cells slightly unequal, slightly pointed, usually without small apical tufts of minute hair. *Ovary* (absent in many flowers) ovoid, glabrous, 1-celled. *Style* short, conic, glabrous. *Fruit* (fide Masters) the size of a cherry, 1-celled, 1-seeded.

Malacca; Maingay No. 256 (Kew Distrib.). Penang; Stoliczka; on Government Hill at 2,500 feet, Curtis, No. 1092.

The Malacca and Penang specimens agree with a specimen at Kew which Miquel has named *E. tomentosus*, Bl. The two species are no doubt close together: but Blume describes the leaves of his *E. tomentosus*, as "setaceous-denticulate" which is not the case here. This tree appears to be uncommon, for Herbarium specimens of it are very few.

22. *ELAEOCARPUS PUNCTATUS*, King, n. sp. A small tree; all parts glabrous except the puberulous inflorescence; young branches thicker than a crow-quill, rough. Leaves coriaceous, oblong-lanceolate, acute, the edges cartilaginous, crenate or serrate, sometimes with a short seta on each tooth, the base much narrowed into the petiole, entire: both surfaces shining; main nerves 8 to 10 pairs, slender but distinct beneath as are the reticulations: length 1.75 to 3 in., breadth .5 to 1.1 in.; petiole .25 to .3 in., channelled in front. Racemes axillary and from the axils of fallen leaves, much shorter than the leaves; rachises and pedicels puberulous, becoming glabrescent. Flowers .25 in. in diam., their pedicels .2 in., recurved. Sepals 4, oblong-lanceolate, sub-acute, puberulous on both surfaces, the edges thickened and pubescent but not recurved: midrib thickened inside. Petals 4, obovoid-oblong, apex obtuse with 5 to 7 short broad teeth, glabrous. Torus a shallow wavy pubescent cup. Stamens 8 to 12; filaments less than half as long as the scaberulous obtuse beardless awnless anthers: the cells sub-equal. Ovary ovoid, glabrous, slightly grooved, 2-celled. Style about as long as the ovary, cylindric, grooved, puberulous. Fruit oblong-ovoid, pointed, narrowed to both ends, glabrous, shining, pale, .5 in. long and .25 in. in diam.; pulp thin, and slightly fibrous; stone crustaceous, sharply rugose, 1-celled by abortion, 1-seeded. *Eluocarpus Acronodia*, Mast. in Hook. fl. Fl. Br. Ind. i. 408 in part. *Acronodia punctata*, Bl. Bijdr. 123; Miq. Fl. Ind. i. pt. 2, p. 213.

Perak; on Ulu Batang Padang, at 5000 feet, Wray. Malacca. Distrib. Java, Sumatra.

The leaves of specimens from Java and Sumatra are larger than those from Perak and have numerous black dots on the lower surface, whereas those from Perak have no such dots. In other respects the specimens agree: but the Perak material which I have as yet seen is scanty. The plant issued by Wallich as *E. punctatus*, (No. 2676 of his Catalogue) is not the *Acronodia punctata* of Blume, but an altogether different plant. Wallich's specimens are very bad, and Dr. Masters (Fl. Br. Ind. i. 406) suggests that perhaps the leaves are those of a *Pterospermum*; in reality they belong to a species of *Parinarium*.

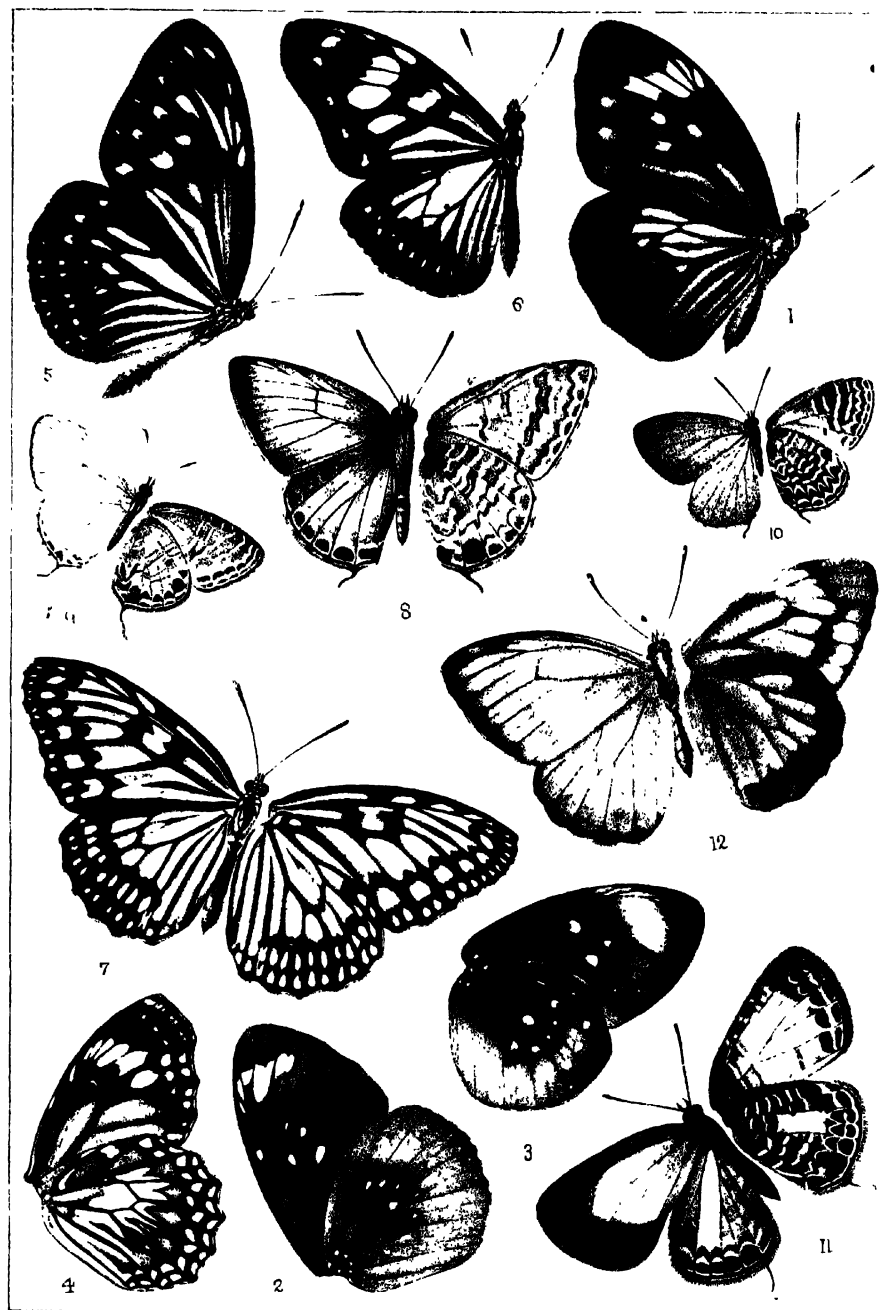
28. **ELAEOCARPUS MASTERSII**, King. A tree 30 to 50 feet high, young branches as thin as a crow-quill, smooth, puberulous; otherwise glabrous except the inflorescence. *Leaves* thinly coriaceous, oblong lanceolate to ovate-lanceolate, acuminate, often caudate; the edge slightly cartilaginous, remotely and faintly serrate, the base cuneate, both surfaces shining and with the rather transverse reticulation distinct; main nerves 6 to 8 pairs, faint, spreading, interarching with in the edge: length of blade 2.75 to 4.5 in., breadth .8 to 1.4 in.; petiole .5 to .75 in., slender. *Racemes* few-flowered, less than half as long as the leaves, from the axils under the apex; rachises and pedicels puberulous, becoming glabrous. *Flowers* 2 in. in diam.; buds narrowly ovoid-pointed. *Sepals* 4, ovate-lanceolate, subacute, puberulous or glabrous outside; glabrous inside on the lower, often puberulous in the upper half and slightly on the infolded edges. *Petals* 4, oblanceolate or narrowly cuneate, the rounded apex with about 15 short teeth, thickened towards the base, veined, glabrous. *Torus* a very shallow wavy pubescent disk. *Stamens* 8 or 9, shorter than the petals, filaments nearly as long as the sub-scaberrulous anthers; the cells blunt at the apex, awnless. *Ovary* (absent in many flowers), ovoid, blunt, glabrous, 2-celled. *Style* about as long as the ovary, thick, cylindric, grooved, glabrous. *Fruit* ovoid-globose, the apex slightly pointed, smooth, .35 in. long and .25 in. in diam.; pulp thin and without fibres: stone smooth, cartilaginous, 1-celled, 1-seeded. *Elaeocarpus Acronodia*, Mast. in Hook. fil. Fl. Br. Ind. 1: 401, in part (excl. syn. *Acronodia punctata*, Bl.).

Malacca; Griffith, No. 681; Maingay, No. 261, (Kew Distribution) Singapore; Hullett, Ridley. Perak; common at low elevations, King's Collector; Seortechini, Wray.

This is a true *Acronodia* allied to *A. punctata*, Bl. (= *Elaeocarpus punctatus*, King, not of Wall.) but is distinguished by its less acuminate longer petiolate leaves, slightly different flowers and smaller more globose fruit. This occurs at low elevations and is a tree whereas the other is a shrub and is found as high as 7000 feet.

#### EXCLUDED SPECIES.

**ELAEOCARPUS PUNCTATUS**, Wall. Cat. 2676 is, (as Kurz pointed out) no *Elaeocarpus* but a *Parinarium*. Maingay's Nos. 621 and 621/2 (Kew Distribution) seem to be conspecific with it.





# JOURNAL

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## ASIATIC SOCIETY OF BENGAL.



### Part II.—NATURAL SCIENCE.

No. II.—1891.

V.—*The Butterflies of Sumba and Sambawa, with some account of the Island of Sumba.*—By WILLIAM DOHERTY, Cincinnati, U. S. A. Communicated by the NATURAL HISTORY SECRETARY.

[Received April 9th :—Read May 6th, 1891.]

(With Plate II.)

The chain of the Lesser Sunda Islands, extending from Java eastwards to Timor Laut and New Guinea, is of great interest from many points of view, but especially from the ethnologist's. For, whereas a slight tincture of Muhammadan civilization, leading to the entire loss of the native product, has made the people of the Malay Peninsula, Sumatra, and Borneo the most uninteresting of all the sons of men, and only the minutest differences distinguish the natives of Penang from those of Macassar, fifteen hundred miles away, every little island east of Java has an astonishing wealth of peculiarities.

Taking the question of religion and government, Bali, the first, is a densely inhabited island, the home of an ancient civilization. The people are of the Hindu faith, the four original castes still prevail there as they did in India in the time of Manu, and suttee, extinct everywhere else, still flourishes. In Lombok, a Hindu aristocracy rules a Muhammadan proletariat of a more recent and less pronounced



civilization. In Sambawa\* there are four Muhammadan kingdoms of considerable age, while a few tributary heathen tribes, but little inferior to them in refinement, inhabit the mountains. In part of Flores, the governing race is a tribe of Muhammadan slave-traders, the curse of all that region, and the pagan mountaineers are in a more or less savage state. In Sumba and Timor there are independent heathen tribes. In Solor, Savu (better written Sau or Sawu), and Roti a large part of the population is Christian. The Dutch have no possessions in these islands, except the town of Boleling in Bali, the fort at Bima in Sambawa, and the neighbourhood of Kupang in Timor. But owing to their command of the sea, they have a considerable, and I believe an increasing influence with the trading community, and with many of the native princes. At the present moment they are trying to get possession of Middle Flores, where tin has been discovered, and, if successful, the occupation must have the happiest effect on all the surrounding islands.

From the philologist's standpoint, all the dialects from Bali to Kupang belong to the Javanese branch of the Polynesian family. In Eastern Timor and the islands beyond, some of the languages are of a totally different type, probably that of the original Negrito inhabitants.

As regards race, no part of the world excels these islands in interest. In and east of Timor, the prevalence of wavy or frizzly-haired tribes, generally of low stature, indicates the Negrito as the first occupant. In Sumba the Polynesians are still numerous, and form the ruling race, while traces of them occur in Sambawa,† and even in the mountains of the Celebes. The people of Roti are a strikingly handsome tribe looking somewhat like the better class of Tamils or Telugus, and their origin is certainly a puzzle. Mr. Wallace suggests that they may be of Portuguese blood, introduced by some unrecorded shipwreck. But they themselves say they came from Serang (Ceram). A somewhat similar race occurs at Melolo in Eastern Sumba, and, I hear, in Flores. In Savu, the people have an obvious strain of Negrito blood, but some resemble the Rotinese, while universal tradition ascribes their

\* So pronounced, also sometimes pronounced Sembawa, or, if written in the Hunterian manner, Sambáwá. The Dutch call it Soembawa, which is not only incorrect, but confuses it, with Sumba (Soomba). It is remarkable that the inhabitants of the island have no name for it, Sambawa being simply the name of the western sultanate. Nothing could more surprise a native of Bima, than to be told that Bima and Sambawa are on the same island. The same is true of Flores, for that pretty word is purely European, and there is no native name for the whole island. I see that the island Dutch propose to call it "Soenda" so that these three great neighbouring islands are to stand as Soenda, Soemba, and Soembawa!

† Lengota, the *glarang* or headman of Kala in the mountains of Sambawa, is a fine example of a Polynesian.

origin to Sumba, and their language scarcely differs from Sumbanese. In Sumbawa, Lombok, and Bali, the flood of Mongolian immigrants has swept away nearly all traces of the original inhabitants, and the people are indistinguishable from the Malays or Siamese. The same race has entered all the islands, I do not think there is a single island in the Archipelago or the Pacific where the Mongolians have not profoundly modified the original population, whether Polynesian or Negrito. In Sumba the mixture is of great interest, because it presents the same features as in New Zealand and among the eastern and higher tribes of American Indians, namely, a race chiefly or largely Mongolian in blood, but Polynesian in language and manners, and ruled by a princely caste of genuine Polynesian blood. Till I visited Sumba I had no idea of the possibility of this state of affairs so far west. But since then I have been struck with the prevalence of Polynesian features, and even to a certain extent of Polynesian manners\* among the higher tribes between Assam and Burma, namely, some of the Naga tribes—the Angamis, Lhotas and Kachhas—the Chins and the Lushais. This country may well have been the starting point of this fine race, whence they have extended their conquests eastwards to New York and Yucatan and westwards to Madagascar, and where, judging from what I saw, they may yet survive after their extermination, now so rapidly going on, is complete everywhere else in the world.

Mr. Alfred Russell Wallace has formed all the Lesser Sunda islands, except Bali, separated from Java only by a narrow strait, into his Timorian division of the Austro-Malayan region. So far as the birds are concerned, he seems to have had good reason for this, for out of 160 land-birds known from the group, just half are found nowhere else, a larger proportion than exists even in the peculiar Celebesian fauna. On examination, however, it does not appear that the group is a zoological province in the same sense as is the Celebes. In that island, a great number of peculiar species, and a certain number of peculiar genera, range over the whole island from Menado to Macassar. But the Timor group contains hardly any peculiar genera,† and the peculiar species are generally confined to one or two of its component parts.‡

\* As regards language, the euphonic and structural rules are remarkably alike, but the roots of Naga words are generally as wholly different from those of the Pacific islanders, as theirs are again from those of the American Polynesians.

† Two genera of butterflies, *Ancistroides* and *Jatana*, have been described from Timor only. But I must confess that I cannot find in either any generic character separating it from its allies.

‡ On examining the British Museum Catalogue of Birds as far as completed—*Passeres* and *Picidae*—I find their distribution as follows. No genera are mentioned as peculiar to the Timor Group, or to any part of it. Only two species are men-

It is simply a long string of islands which has received waifs and strays from various quarters, the eastern ones, Timor, Timor Laut and presumably Wetter, chiefly from the Moluccas, New Guinea, and Australia, the western chiefly from Java. As the stream of Javanese immigrants, crossing narrow seas, is regular and unceasing, the species from that quarter have had fewer opportunities of differentiation, while the visitors from the eastward have for the opposite reason generally become distinct. This renders the fauna of the eastern islands more interesting to the naturalist, and Timor Laut, Wetter,\* Sumba, and the high country of Timor, offer a field of unusual interest.

But Lombok Strait, now known in science as Wallace's Line, after the great naturalist who discovered its faunal importance, is nevertheless an important frontier, cutting off a host of Indo-Malayan forms† from Lombok and the islands eastward, and a few Austro-Malayan forms, such as the cockatoos, from Bali and Java. However, it seems hardly so deep as Mr. Wallace supposed,‡ and it is not impassable even to mammals, seeing that the tiger has of late years crossed it, and is now,

tioned as common to the Indian and Australian regions, passing through these islands, but no doubt a few additional wide-ranging forms could be added.

#### Timor.

Peculiar species,	...	...	...	...	29
Extending to Flores only,	...	...	...	...	5
„ „ Lombok only,	...	...	...	...	2
„ „ Bali, „	...	...	...	...	2
Indo-Malayan,	...	...	...	...	13
Austro-Malayan,	...	...	...	...	3
					—
					54

#### Lombok, Sambawa and Flores.

Peculiar species,	...	15	(Flores 4, Lombok 4, in com-
Extending to Timor only,...	...	7	mon 7).
Indo-Malayan,	...	28	
Austro-Malayan,	...	0	
		—	
		50	

So that only seven species (or nine including the two extending to Bali) are confined to the group, as a group, and no Austro-Malayan species extends west of Timor, while the Indo-Malayan species are numerous.

Nothing whatever is known of the birds of Sumba.

\* The island of Wetter seems to be wholly surrounded by deep sea, and merits examination.

† Such as the *Cyprinidæ*.

‡ The depth of Lombok Strait, as now given, seems hardly over fifty fathoms at the deepest part of the shortest line across it. There are several islands in the Strait.

I hear, making fearful ravages among the herds of ponies for which Lombok was once celebrated. As the dividing line between homologous species, Lombok Strait is probably less important than Ombai or even Sumba Straits. I should rather call it the boundary between the Indian Region and the neutral zone beyond, than that between the Indian and the Australian regions.

Sumba is one of the largest of the Lesser Sunda islands, having an area probably exceeding six thousand square miles, for the unexplored southern coast-line, drawn on the maps as concave, is really convex, giving great breadth to the island.\* It is called Sumba or Humba (the S and H being interchangeable here and in Savu, which is generally called Hau by the natives) by all the tribes inhabiting it, but on the maps the more usual names are Chendana (Tjendana), Sandelhout and Sandalwood, names of the same significance, given not because, as has been stated, sandalwood is exported, but because that tree is said to be *tabu* (or *pakili* as the Sumbanese say) to the inhabitants, so that if any one chances to break a twig of it, he is cut into small pieces, and scattered about under the sacred branches. At least, that is what the Malays say, but the Sumbanese, both the mountaineers and the coast-dwellers, entirely deny the existence of the tree on their island.

Deep sea separates Sumba from Flores, the high peaks of which are distinctly visible from Nangamesi Bay, but a bank covered by 50-80 fathoms of water, connects it with Eastern Sambawa, while on the side of Savu and Roti there is apparently deep sea again. No part of the coast has been surveyed even in the most cursory manner, but on account of the development of the horse-trade, the north-east coast from Laura to Réndi has become pretty well known to Arab and Bugis skippers. Except Tarimbang, which has not, I believe, been visited for generations, there is no harbour anywhere in the island. The roadstead of Waingapu or Wayapu, the chief port, is difficult of access, lying between two long coral reefs laid bare at low tide.

The aspect of the north coast of Sumba is most forbidding. Long naked headlands—Sasa, Ngarulubu, Mandolu, famous for their horses—extend far into the sea, marked with the lines of raised beaches. All this side of the island, for as much as forty miles inland and up to a height of two thousand feet, is covered with a sheet of coral overlying sandstone.† The coral must be of considerable age, and is often extraordinarily hard, reminding one of the ancient metamorphic lime-

\* The southern coast of Sambawa is set down quite wrongly on the maps, as I could see from the top of Harubasa.

† Near Kawangu the sandstone is uncovered, forming hills curiously carved and water-worn.

stones of Greece, in Bœotia and Arcadia. Its surface is infinitely rough and broken, capable of destroying the stoutest boots in a few days. It is owing to this that the Sandalwood ponies develop such hard hoofs that they rarely require to be shod. Fortunately, wherever the ground is level, the coral is hidden by a coating of indurated clay like laterite, and the native paths keep to this as much as possible. A scanty growth of grass, especially the horrible spear-grass, which renders travelling almost unendurable, covers the coral. Wherever the surface consists of irregular piles of jagged fragments, bristling with needle-like points, and full of deep rifts and well-like cavities, a dry, thorny jungle grows, since horses cannot find foothold there, nor fire reach it. The grass is burnt every May or June, and for some months later, the country is as black as a coal, but travelling is easier and is usually done at this season. In some places the soil is exceedingly rich, and the population dense, especially in Melolo and Laura; but the country is everywhere dreary, and is far from green even just after the rains. Nevertheless this region, the north-east coast from Laura to Réndi, is the civilized part of the island, and the seat of all the larger states. The coast itself is generally uninhabited for several miles inland, owing to the depredations of the Eudinese pirates. The heat is terrible, but the coast seems singularly healthy, and the climate is more like that of Northern Australia than of the Indian Archipelago.

Till I came to Sumba, no European had ever visited the interior. Learning from the natives that a well-wooded and watered tract existed inland, I pushed across forty miles of a desolate coral wilderness and reached a wholly different country. At Pada Dalung, and thence to Mandas\* (south-west) and Karita (south-east), and, I was told, to Tarimbang on the south coast, the rock is stratified and calcareous, apparently a soft decomposed chalk, and in one deep ravine I saw some huge round boulders which may have been granitic. The interior of the island is a great plateau, somewhat hollowed out in the middle by the river Kambéra, which rises in the forests around Léwa, and in that called Kétikujara or the Horse's Head, west of Mandas, flows eastward, and near Mandas is a considerable river in deep jungle, difficult to ford, haunted by crocodiles, and much larger in volume than at its mouth seventy or eighty miles below. Indeed most rivers of northern Sumba tend to disappear on approaching the coast. The table-land is flat in general outline, but deeply cut by an infinity of exceedingly steep ravines each with a clear swift stream. Flat or steep it is everywhere the richest possible meadow land. The forests lie in great masses, and, except

\* Or Mandasu; spelt Maanalas in Mr. Roos's map of Sumba, which, except over a part of the north coast, seems to have been compiled wholly from hearsay.

at Tabundung and one or two other exceptional places, they are wholly trackless and serve as the boundaries of hostile tribes. West of Mandas, the country appears to descend steeply into the Indian Ocean. This slope was described to me as covered with high forest, with a heavy rainfall\* and a coast so stormy as to be inaccessible during the greater part of the year. The height of the tableland of the Kambéra is usually about 1500-2000 feet; the hill at Pada Dalung must be about 2500 feet above the sea. The climate of this region is delicious. South-east and north-west the country rises, and by its upward trend conceals whatever high mountains may be in that direction. The great isolated *massif* of Tabundung, covered with high forest, lies south of Pada Dalung, and must be about 4000 feet high. East of this is the unknown *tana maringu* (cold country) of Masu, which lies back of Melolo, and is sacred ground. No war may be fought there, and the buffalo and horse have run wild, since those that escaped thither might not be caught and brought back. Masu is the Olympus of the Sumbanese, regarded as the original home of their ancestors, and the place whither their own souls shall go after death.†

West of Pada Dalung the country again rises, and beyond Léwa Paku (*Old Léwa*, the original demesne of the present king of Léwa, who now owns all the middle part of the interior plateau), and the sources of the Kambéra, lies another "cold country," probably of considerable height and extent. This is inhabited by rude mountain tribes, not yet visited either by Europeans or by the Arab and Bugis traders. West of Perwatana and Anakala, on the border of this region, which is called by the general name of Wayéwa, lies a great forest, and then comes Kodi, beyond which the land sinks precipitously into the sea near Gaura or Garu.

A volcano has been said to exist near Tarimbang on the south-western coast. But some people of that state told me this was quite untrue. However, the mountain of Tabundung, which I did not succeed in reaching, may possibly be of volcanic origin. This district, though rather out of the way, seems to be the best accessible collecting-ground on the island.

\* In Java and all the islands to the east of it, with the possible exception of Timor, the rainfall is far greatest on the southern and south-western sides. Thus at Tjilatjap (south coast of Java) the rainfall is 170 inches, at Surabaya 65. At Bima in Sambawa it is 38 inches. At Waingapu in Sumba it can hardly be more than 20, while at Pada Dalung it must be fully 100 inches.

† The Muhammadans of Sambawa, call their Heaven by the Sanskrit name *Sorga* (*Swarga*), and, I believe, say it lies in some distant mountains to the westward, perhaps a idea derived from the Hindus of Java. Hell is called *Anaraka*.

The upland forests of Sumba are less luxuriant than in Java or Sumatra, and are singularly free from thorns and underbrush, but many of the trees reach the height of a hundred feet, and some of the figs are of enormous girth. The only bamboos on the island occur in the dry valleys near the coast. Palms, except the *lontar* or palmyra, and a few arecas, are exceedingly scarce. The Endinese, who import cocoa-nuts, always destroy the germ of each nut, which perhaps accounts for the absence of this useful tree.

Of the animals of Sumba I can say but little. The natives think there are three kinds of monkeys, but I saw only the *Macacus cynomolgus*, which is very common and tame. A deer like the *Cervus muntjac* is said to be common, as well as another with large branching horns, which they call by the Malay name of *rusa*. Wild pigs abound, and a wild cat. Among birds, cockatoos are so numerous that I have seen the trees white with them; the species is the common lemon-crested one.

Among domestic animals there are pigs (*wei* or *wawi*), goats, fowls (*manu*, a Javanese word), a few buffaloes (*kalambua*, a softened form of the Malay *kribau*), cats (*kamembu*), dogs (*ashu*), and pigeons. Buffaloes are used chiefly for ploughing and for funeral sacrifices. They are the largest animals of which the Sumbanese have any conception, and a huge, ferocious kangaroo-hound, who goes about with the king of Léwa as a very efficient body-guard, has been called by the awe-struck natives the "Roaring Buffalo." Fowls are used chiefly in taking auspices, and pigs and mares are the animals generally employed for food.

Horses are the most valuable product of the island, and "Sandalwood ponies" are perhaps the best in the world, and well known as far as Rangoon and Hong Kong. They are called *jara*, a word which, like the Malay *kuda*, is derived from the Sanskrit *ghora*. The horses live unguarded in troops of twenty or thirty, each having its own range of pasture, the limits of which are carefully respected. Being very curious, they used to follow me for miles over all obstacles, but never dared to cross the ravine which bounded their beat. The colts generally follow the leading stallion (and not their dams) in a long string, which has a most absurd appearance. The mares are rarely ridden, and as in Sambawa are kept for breeding and for food.\* Only stallions are exported. The trade is wholly in the hands of the Arabs and Bugis, who carry the horses to Surabaya in their own vessels at a fixed time every spring. The Sumbanese are the best rough-country riders I have

\* In Sambawa, though the people are Muhammadans, a man is allowed to kill a mare on his birthday and make a feast for his friends. This is also done at the end of Ramasan; and even the Imams do it, though they may have made the Mecca pilgrimage. The Do Donggo sacrifice mares at the time of the rice-harvest.

ever seen, (and I have lived among the Turkman, Bedawin and Iliats), galloping bare back down the steepest slopes. On foot they are a singularly helpless people, and would rather ride twenty miles than walk one. They are fond of their horses and give them the most ornate names, those of mine being interpreted to me as "Beautiful Flower," "Wind in the Grass," and "Lightning." No woman is allowed to mount a horse, and I have seen a princess on foot while her attendant slaves were mounted.

The staple food in Sumba is millet (*usukani* or *uhukani*) and maize,\* generally planted alternately, and rice (*usuberesu* or white grain), which is hard to obtain except on the coast. The wet cultivation of paddy is unknown,† though the late king of Taimanu tried to introduce it at Yawahapi-Lukukatoba. Maize is usually eaten parched. Meat is only eaten on great occasions, and there are scarcely any vegetables. Curiously enough, the use of toddy (palm-wine) is unknown, though so common in Flores, Savu, and Roti, and even in the Muhammadan parts of the Celebes. Considering the wealth of the people, and the cheapness of Java rum, the Sumbanese are a sober people, and most of the mountaineers have never tasted spirits. The use of betel is universal. Salt is very scarce and dear.

The people of Sumba do not probably number less than 100,000, and perhaps much more if Laura and Melolo are really as populous as they are said to be. A small colony of curly-haired Savu people are settled at Waingapu and Kabaniru, and a similar race at Memboro. Some of the Melolo people are said to resemble the Rotinese in feature. Otherwise, the bulk of the people may be said to be Mongolians resembling the Javanese, with a Polynesian aristocracy.‡ The former are

\* Maize is probably a recent introduction, but I could hear of no tradition on the subject. A common species of sorghum growing in marshes is called "wild maize." In many of the islands, the word *jawa* or Javanese is applied to maize, showing whence it came. In Sumba the word is *water*, but in Savu *water-jawa*, in Roti *mbela*, in Timor *pela*, in the Moluccas *milu*, in Ende (Flores) simply *jawa*, in Roka (Flores) *hai*, in Sambawa *baso*. The word *jawa* is applied to anything foreign.

\* Europeans are called "white Javanese," and I was generally known in Sumba as *umbu maremba jawa* or the King's son from Java.

† The Do Donggo of the mountains of Sambawa have some of the finest wet paddy fields I have ever seen. Yet they are far inferior in capacity to the Sumbanese, and preserve a curious memento of their recent savage state in an annual three days' pilgrimage to the mountain-tops, where they sleep in the open and live wholly on what game they kill, leaving the villages guarded by the dogs tied up in the houses.

‡ Some of the western hill-tribes may belong to a lower race. The Kodi people are said to be of short stature, and to turn the toes inwards in walking, especially the women. To "walk like a Kodi woman" is a staple joke, appealing strongly to the Sumbanese sense of humour.



the same as everywhere. The latter are tall, light-brown men, of somewhat slender, but graceful and manly proportions. The face is rather long, with a Roman nose and a finely-moulded chin; the hair is straight, rather dry and stiff, and a beard is not generally worn. The women are often of a refined and high-bred, though somewhat grave and melancholy beauty, contrasting strangely with their barbarous condition. The quiet dignity of the men is in striking opposition to the innate vulgarity of all Mongolians from Turcomania to Malayana.

The Sumbanese, both men and women, wear a large loose mantle of Manchester cotton dyed black in the mud of the rivers. The women wear also a short black skirt, and on gala occasions a black jacket tastefully embroidered with beads and small cowries. The men wear a waistcloth, a turban, a huge ivory armlet, and a heavy belt like that worn by the Greeks and Albanians, containing their krisses and *parang*. They always go about with a square mat-work satchel, generally of very pretty design, containing betel. They exchange betel with everyone they meet outside their village, as a sign of peaceful intentions. I had to carry a supply about also, and never dared to decline it, though it is not at all nice, for the Sumbanese could only explain a refusal as a sign of hostility, just as Bedawin would excite at the refusal of salt. Bows are unknown in Sumba, and so are fire-arms, but a man goes nowhere without two spears, which are never laid aside for an instant. In the remote district of Mandas, I was amused to see that my visitors had covered their spearheads with sheaths tied on with thongs, as if to reassure me, reminding me of the old Norse custom.

“Thereat was the Wrath of Sigurd laid fast in a silver sheath.  
And the peace-strings knit about it, for the blade was fain of death,  
And 'tis ill to show such edges to the broad blue light of day,  
Or to let the hall-glare light them, if ye list not play the play.”

The Kambéra language is understood over the greater part of the island, but Gaura and Laura in the west have languages of their own, and the Memboro dialect is very distinct. All these are closely allied to the Javaneese and the languages of Sambawa and Flores. I have taken vocabularies of a number of these, which I hope to publish some day.

Strange to say, Sumba has a currency of its own in the shape of fine copper wire very intricately plaited and cut into lengths of two feet, worth half a rupee each. The ugly, fish-shaped earrings of gold beaten out thin, are always of the same size and value (about a dollar), and are likewise used for money.

The women have spinning-wheels and weaving-frames, and make cloth, especially blankets, generally white with curious figures of fish,

tortoises, prawns, ships, men, deer, etc., but all so conventional in form and so harmoniously arranged that the effect is good. The men also make nets and ropes, both of excellent quality and largely exported, and at Kadungu (Memboro) good pottery is made. The chief exports are horses, slaves and edible birds-nests.

There are three castes of Sumbanese, the *marembo* or lords, the *kabisu* or freeborn citizens, and the *towata* or slaves, the latter being the most numerous.

The ruling classes marry chiefly among themselves, and are inter-related in a most puzzling fashion. Marriages are arranged by the parents, and are of two kinds. If the wife is bought, whether with money or with service, she enters her husband's tribe. In this case she is his property, and he can kill her if he likes. If he pays nothing, he enters her tribe; but this is less usual. Polygamy is not common, but if a man's sisters-in-law remain unmarried, I believe they are after a time considered as his wives. The Sumba women make faithful wives, but before marriage incontinence is universal, and every girl, slave or princess, has her price. Infanticide and abortion are very common, and it is probably largely for this reason that the population is not increasing. Islam always, and Christianity often check this evil, so that the population is large and increasing in Muhammadan Ende and Sambawa, and again in Christian Roti and Solor. The old are treated with great respect. The Sumbanese struck me as a brave, honest and truthful people. But they are too proud to work for others, and will never become a thriving agricultural race like the Javanese.

Exogamy is usual, and the rules of intermarriage are often inconveniently complicated. For instance, I hear that Kanata men marry only Lakoka women, and Lakoka men only Soru women. Now Lakoka\* and Soru are small independent states in the interior, while Kanata (or Lubu) is fifty miles away on the coast of the Taimanu state.

Apart from the wars of extermination waged now and then by the great chiefs, disputes are continually going on between neighbouring tribes, generally concerning boundaries, horses, or women. They are usually settled without much bloodshed in the following manner. The men meet in a meadow, and form two lines on horseback. Then the chiefs recite war-songs, and make speeches, and the two sides exchange

\* In 1886, shortly before my visit, the king of Léwa sacked Lakoka, in alliance with the Ende slavers. The men were killed, the king took the horses, and the women and children were carried off to Flores as slaves. This is the usual way in which the Endinese do business. It is to be hoped that the Dutch troops now in Flores will put an end to this murderous little state. Its supremacy in this region is owing to its possession of ships and rifles, of which the Sumbanese have none.

abuse and defiance in the Homeric fashion, till the proper degree of excitement is reached, upon which they charge, fighting with spears and shields. As soon as anyone gets speared, his side acknowledges itself beaten and pays a fine, while the others celebrate their victory with much noise and feasting. The horses on these occasions are decorated with collars of white horse-hair, and immense frontal tufts, giving them a most ferocious look, and are said to enjoy the fighting thoroughly. Sham fights, very similar to the real ones, and quite as dangerous, are often held. But horse-fights are the characteristic amusement of Sumba. Two stallions and a mare are placed in a little enclosure, and the former fight till one is dead. On great occasions there is dancing, generally performed by women, and sometimes a poet will sing the praise of his forefathers, exhibiting the skulls of their conquered enemies which have descended to him. The musical instruments in use are drums, gongs, and a guitar with two copper strings.

The dead are buried,\* household articles being broken and thrown into the grave as in the Nicobars. A large oval horizontal slab of stone surrounded by small upright ones, marks the grave. The bodies of chiefs are exposed on the mountains for months after their death. When a propitious time for the funeral comes, a great feast is held, many buffaloes, pigs and mares are killed and eaten, and a number of slaves, both men and women, are strangled and thrown into the grave.† When I was in Sumba, the body of the late king of Taimann had been lying exposed at Semparingu for more than a year.

I cannot say much about the religion of Sumba. The island presents a remarkable contrast to Sambawa in this respect. In Sumba, though there are a few *ratus* or professional magicians of little influence, the chiefs are the real religious leaders, and it seems to me that the union of church and state in the hands of practical men managing large temporal affairs has kept superstition in bounds. In Sambawa, both in the heathen and in the Muhammadan parts, the *jukis* or sorcerers are the descendants of the old local chiefs, now replaced by a centralized bureaucracy. Reduced to mere tricksters and jugglers dependent for their food on the popular faith in their magic powers, they have made the people as superstitious as any in the world. The same is the case

\* The Do Donggo in Sumbawa are buried sitting, but I can find no note of the Sumbanese custom.

† On the death of a Sultan of Mbojo (Bima) in Sambawa, 199 buffaloes are sacrificed. A new flagstaff is raised by his successor, and a slave is said to be strangled and buried beneath it. This, if true, illustrates the extreme conservatism of the East, for the people of Bima may be almost called a civilized race, and have been Muhammadans for some centuries.

with the heathen Do Donggo. Here the sorcerers hold a higher rank as *juhi Perafu* or priests of the god Perafu. But all temporal power is in the hands of the *glarangs* or headmen. The result is, that the *mori*, or ancestral spirits, and the *héncha*, or demons, are never out of peoples' minds, everything seen or done has some good or evil significance, there are sacred trees, mountains, springs, stones, and animals, while every spot is the scene of some absurd legend. Each village has its priest's house, priestess's house, and its *uma Perafu* or house of Perafu, closed, empty and of very archaic make. Belief in the evil eye, in the unluckiness of a thousand acts and signs, in the constant presence of evil demons, and in the disastrous effect of anything unusual or unc customary, make these people the timid, unhappy race they are.\*

The Sumbanese are said to worship one greater god, described as *umbu walu mendoku* or *he who makes all*, who owns all the sandalwood. Also two deities called *umbu awan*, lord of heaven, and *umbu tana*, lord of earth, to whom worship is paid at harvest time, and rice, pigs, horses and buffaloes sacrificed. They also believe in evil spirits, and the huge fig trees in some of the villages are apparently held in veneration. Certain things also are sacred, and hence *tabu* or forbidden (*palili* in Sumba, *léo* or *pomali* in Timor, *perafu* among the heathen of Sambawa). Though the crocodiles receive no regular ceremonial worship as in Roti,† the Sumbanese nevertheless throw them meat, saying, "Don't eat

\* For instance, when I was at Kala in the Donggo country, the *juhis* kept praying and sacrificing all night to prevent evil resulting from my stay there. At Pelunto the people threatened to abandon their homes when they heard I was going to climb Haruhusa, the chief mountain in those parts. And when I returned and nothing happened, they said I had not really done it, just as when the alpinist climbed Ararat, the Armenians would not believe it, because he had not seen the Ark standing intact on the summit, as St. Mesrob had seen it in his dream. At Oo, the *juhi* declared that my visit had caused the terrible ruins we had then. Out of revenge I rolled my eyes at him tragically, and repeated the first stanza of "Simple Simon met a Pieman" once or twice when I met him, upon which he fled the country. Such things are quite impossible in Sumba, and their own little devices for keeping off the evil spirits are performed in rather a sceptical mood. As in India they snap their fingers when some one sneezes. If a young man hiccups, they box his ears, if an old man, they ask him respectfully why he did it, to which he calmly replies that he never did, and there is a general smile.

† The following story was told me by Mijneer Teffer, whose wife, a remarkably beautiful woman, now a Christian, was the daughter of the king of Hai in Roti. There is a caste of priests of the crocodile there. When they want to travel by water they call the crocodile, and he carries them wherever they wish on his back. On a certain day they go down to the bank, and call the crocodile, describing to him their rank and duties. When he comes out, they take him up and carry him, with a band of music and an applauding crowd, to his temple. There they give him rice and sweetmeats, put a robe on him, and begin praying over him. He dislikes the praying

me, but eat such a man, my enemy." But the chief Sumbanese deity is Merapu (the name is obviously equivalent to the Sambawan Perafu), who is the hearth-god, a kind of aggregation, I imagine, of the ancestral spirits. But some say he is a man who lives in Masu, and is a kind of intercessor with the great gods for men, and especially for kings. He is described as black in hue, for when I asked why the Sumbanese dressed wholly in black, they replied that it was Merapu's colour. The largest insect in the island, the black butterfly I have named *Papilio merapu*, is sacred to him. They pray to him in the forest, placing betel, siri, and a bit of gold or silver on a leaf, and setting it on the ground say "Merapu, give me this and that, pasturage for my horses, rain for my maize, and vengeance for my wrongs." Slaves pray to Merapu that the king may live a hundred (*ngasu*) years, for they are afraid of being sacrificed at his death.

The houses are large, with a thatched roof pointed at the top, and a floor raised five or six feet above the ground. Inside, the fireplace is always surrounded by four posts. That on the right hand on entering is called Merapu's post, and the enclosure is sacred to the god. Oaths are taken by laying the hand on this post, and no one is allowed to sing or play the guitar indoors when a fire is on the hearth.

Houses are gathered in a *paraing* (generally called *paré*) or village, or in a *negeri* (Sanskrit, through the Javanese) or town. The political unit, at least in the interior, is a group of open villages, protected by a fortress (*kota*, Sanskrit through the Javanese). Thus Watupéli is the central fortress of Melolo, Kamanu of Mandas, and Lambanapu of Kambéra. On the plains, these fortresses are defended by intricate cactus hedges, but I was told that in Laura (I think) towns are strongly walled with stone, as is the case with some of the hill forts elsewhere. These last are often very striking. Lateng in the Taimanu state, is built on a sharp spur of the mountains, the *col* connecting it with the main mass fortified by wall after wall. On the other side, the hill descends at a very steep angle to the river a thousand feet below, and this almost inaccessible gorge is so industriously cultivated as to be a perfect nest of verdure in this dreary country. In times of peace these forts are often left almost unguarded. Once I lost my way at nightfall in the Kiritana district, but when the moon rose I struck a path, and rode through a country of alternate thorny jungle, and meadows studded with great upright blocks of coral-like tombstones,

and struggles, so that it is necessary to quiet him with more food, and begin the prayers again. When the prayers are said, they carry him back to the river with music and dancing, and when he enters the water all the other crocodiles rise up and pay homage to him as their king.

worn into a thousand fantastic shapes like Gothic gargoyles. The impressive uncanniness of this place I cannot describe; my horse was in an agony of terror. Finally I came to a citadel on a steep crag, and climbing the wall in constant expectation of attack, I found a mass of huge fortress-like houses of stone, bigger than any built nowadays. After I had gone over most of them and found them full of grain and household utensils, but without inhabitants, I finally stumbled on three very old men, who were speechless with amazement at seeing me. They were in charge of the place and had not had a visitor for months.

The little district with its sheltering citadel was probably till modern times the only kind of state in Sumba. The recent evolution of governments like Léwa and Melolo has as yet had but little influence on the people of the interior.

On the coast, one can now ride from Waingapu to Melolo without receiving anything from the men he meets but polite salutations. In the interior, even in the middle of the Léwa dominions, I never met a native not belonging to the village where I was staying, but we both prepared for battle, and spear and revolver were held in readiness till we had exchanged betel. Twice I was within an ace of being speared, because I came on men suddenly in the forest. When two parties meet, they halt when yet a long way apart, dismount, and drive their spears deep into the earth as a sign of peace, then exchange a "cooney" (the well-known Australian cry, much used in Sumba), and yell out a question or two. Then two men advance, one from each party, and exchange betel, after which the others come forward warily, keeping a good grip on spear and shield. In spite of the tyranny of the kings over their subjects, and their occasional ferocity to conquered enemies, centralized government of any kind is better than this constant distrust of one's neighbours. The northern kings of Sumba have greatly strengthened their power by making it hereditary. The *umbu maremba*, or heir-apparent, is a power even in his father's lifetime. Whereas in Ende, Roti, Savu, and in the less advanced states of Sumba, the king's successor is elected by the nobles from the royal house.

The most powerful of the Sumba kings are those of Léwa (who holds Kambéra by right of conquest), and Melolo (who ruled half the island a generation ago), whose son rules at Petawang. West of Léwa come Taimann, Kapundu, Palmédo, Kadungu (or Memboro), and finally Laura, which is said to be of great interest, but which has not been visited by any European. The Dutch claim allegiance from the Savu and Timorese immigrants at Waingapu and Kabaniru as well as over a few Arabs, Bugis, and Chinese who trade at Waingapu. But these all pay tribute to the king of Léwa, and the only time they

refused it, he plundered the village, and drove the Dutch agent out of Sumba. When the unhappy Achinese war is over, it is to be hoped that the Dutch will pay some attention to this fine island, hitherto neglected. Owing to the absence of fire-arms, it could be subjugated by an insignificant force; the horse-trade properly developed would prove a mine of wealth; and under settled government the island would be as prosperous as Roti or the Minahasa. However it may have been in the last century, no people in this can rule semibarbarous races better than the Dutch—when they think it worth their while.

Some idea of a Sumbanese king may be gathered from an account of my visit to Tunggu, king of Léwa, which I made with my kind friend Mr. K. H. de Roo van Alderwereld. The king was then at Kawangu near the coast.

We rode from Waingapu across the Matawai, past the Savu settlement of Kabaniru, and reached the Kambéra river, where women were dyeing cloth in the black mud, and a frizzly-haired Timorese was fishing in a canoe. Forging the Kambéra and the Palamenjéli with much difficulty, we reached Kawangu, a village of thirty large houses. A narrow path wound zigzag past three great concentric hedges of cactus guarding the place, and brought us to the king's house. He was an ugly old man, well over six feet high, wearing nothing but a dirty waist-cloth, his skinny limbs uncovered. His long hair was white and knotted over the nape of his neck, his eyebrows were black and stood out from his head, the hairs more than an inch long, shading a pair of singularly bright, unsteady eyes, and giving him an extraordinary appearance. He shook hands with us feebly with his paralyzed left hand, holding his spear in his right all ready for action, for he is forever suspecting some treachery. He had two mares led up, and drove his spear into the throat of each with a wild shout; then he killed a pig for us, saying, politely, "Pork is for kings' sons, but mares' meat is good enough for soldiers." For the mares' meat was for his body-guard, a number of handsome and splendidly-formed young men, with whom he was at that time hoping to conquer the whole island. Later on, we saw him standing among them ladling the boiling meat out of a huge pot, and saying, according to our interpreter, "Eat, my children; he who fights shall eat meat; let slaves stick to millet."

He took us to see his elder brother, who was slowly dying of cancer, and had therefore given up the throne to him many years before. When my trip into the interior was suggested, he coolly made a counter-proposal that we should both go and help him in his campaign against Anakala. For he has no fire-arms, and no doubt thought a rifle or two would have great effect on those sturdy mountaineers. On our

declining this, he invited the leading nobles into the council-house and consulted the auguries about my journey, examining the liver of one fowl after another till one suited him. Every stain or flaw in the liver has its own meaning, and I was surprised at the acuteness of his inferences regarding them. Sometimes he would consult some of the old men, who seemed quite familiar with the science, and evidently considered it as reasonable and reliable as the multiplication table. The king is held the best haruspex in the country, and is also proud of his skill in causing rain or drought. He remarked incidentally that he would give me good weather for my trip. We sat up till late listening to a minstrel singing a song of the king's composition, twangling a guitar the while. The king sat glancing sharply at us alternately, some nervous affection keeping his head and hands in constant motion. Meanwhile his followers sat in a circle round him, looking singularly dignified and austere. They wore black mantles and turbans, their belts were full of handsomely-mounted weapons, their fine Roman faces perfectly quiet, in striking contrast to their master's, whom they so surpassed in dress and bearing. Still I think I understood then somewhat of the power which made this ignorant savage a ruler of men, personally more revered than any sovereign in civilized countries.

The butterflies mentioned in the following list were taken in 1887. The Sambawan specimens are in the hands of Mr. B. Neumoegen. The Sumba ones have remained four years in my possession, during the course of which most of them have suffered greatly, and many of the best have disappeared or been destroyed, including several uniques, of which I have only descriptions made at the time. As, however, no one may visit the interior of Sumba again for many years to come, I shall include these descriptions here. Owing to my small knowledge of Moluccan and Timorese butterflies, and the absence of specimens for comparison, my work is necessarily imperfect. When described, the Sumba butterflies will be sent to M. Charles Oberthür. Of the Sambawa butterflies I cannot give a complete list, and I am obliged to omit most of the *Eupleas* and some others. At the time I was there, I counted about 140 species taken in each island. In this list I number only the Sumba species, those from Sambawa being introduced chiefly to illustrate the geographical distribution of the species, and to describe a few novelties.

There is a considerable Austro-Malayan element in the Sumba butterflies, but very few of these forms reappear in Sambawa, *Ornithoptera naias* and *Danaïs (Nasuma) haruhasa* being the most remarkable of those that do. The list scarcely does justice to this element in



Sumba, since a *Doleschallia* and a *Charaxes* probably of Moluccan type escaped me, and of a *Hypolimnas* apparently near *H. pandarus* I made no description, and the specimens are lost.

A few Papuan or Timorese forms occurring in Sumba do not extend to Sambawa, such as *Rqdena oberthurii*, and the above-mentioned *Doleschallia* and *Hypolimnas*. In one or two cases a species occurring with little change from Java to Timor has a wholly different representative in Sumba, as in the case of *Papilio maremba*. Ten Sumbanese forms are represented in Sambawa by other allied species, namely, six *Danaidæ*, three *Pieridæ* and a *Papilio*. Nine species of *Danais* occur in Sumba and nine in Sambawa, and of these six are the same, and three different. Ten species of *Euplexa* (of nine different groups) were taken in Sambawa, and only six in Sumba (perhaps on account of the continual rain in the interior), of these only one, a large *Salpinx*, was common to the two islands. The dominant *Euplexa* of Sumba was apparently *E. lewa*, that of Sambawa seemed to be the Javanese *E. (Selinda) eleusina*, and both have their mimics. *Trepsichrois*, of which a species is peculiar to each island, appears as a mimic, and rare, whereas further west it is usually a dominant genus.

Information regarding the seasonal forms of the *Satyridæ*, will be found under the head of that family. It will be seen that in these islands the non-ocellate brood appears when the ocellate brood appears in India, as might be expected, the seasons there being similarly reversed. In Sambawa I reared both forms of *Melanitis leda* from the wet-season one, by keeping a wet sponge along with the chrysalids in one box, whence only the ocellate brood was obtained.

My discovery of the dimorphism of these insects, made in 1882-3, and my theory regarding its cause, have now received confirmation from all sides, and may be regarded as proven.

My collecting in Sambawa was in the eastern part of the island in the sultanate of Bima or Mbojo, and was unfortunate, owing to the heavy and unseasonable rains. Owing to the assistance of Mijnheer A. C. de Heer, Controleur of Bima, for whose kindness I offer my best thanks, I was enabled to visit the mountains west of Bima, the Sultan sending his brothers to arrange matters for me. These mountains, which are of some height—two of the peaks, Haruhasa and Ndindi exceeding five thousand feet in elevation—are in the district of Bolo, the capital of which is Sila, and are inhabited by a timid race called the Do Donggo Bolo to distinguish them from the Do Donggo Kai near Prado. The higher parts of the mountains have a very wet climate, and are partly meadow and partly forest. The latter is exceedingly rich and luxuriant, resembling that of Sumatra or Borneo, but is of no great height on account of the violence of the wind.

My impression is, though I can scarcely prove it by lists of species, that the insects of this mountain region, are almost purely Indo-Malayan, or at least more so than those of the coasts. If this is true, it does not at all agree with Mr. Wallace's belief that the Indo-Malayan element is of recent introduction. As these mountains are very easy of access from Bima, where steamers stop every month, and as travelling in the island of Sambawa is safe and pleasant, it seems a pity that some competent ornithologist does not investigate the birds of this district, which ought to afford many novelties.

#### Family DANAIDÆ.

##### 1. *SALPINX MEIZON*, n. sp.

Male, above, forewing rich brown with blue reflections, a short slender pale lilac spot in the interno-median space, a costal spot and seven large inner-submarginal ones, light blue with purple reflections, generally pointed outwardly and inwardly, the second largest, separated only by a vein from the first, which is prolonged costally, the last with an obscure streak below it. Hindwing with the blue gloss much less conspicuous, the velvety patch pale ochreous externally, darker internally; two or three small subapical lilac spots. *Below* dark brown, both wings with the cell and the spaces just beyond it much paler than the outer part. Forewing with a costal lilac dot, and sometimes one or two subapical, a larger one in the lower median space; below the lower median vein a large ochreous area, pale brown in the middle, extending below the submedian vein, enclosing a short sericeous band. Hindwing with a varying number of minute inner-submarginal lilac spots subapically, and sometimes two or three still smaller outer-submarginal ones subanally.

The basal tuft of the male is very large, light reddish at base, fuscous outwardly; the outer tuft white, very short.

Expanse of male over four inches, the female still larger. Type from Sumba, where it is scarce, also occurring in Sambawa, apparently unchanged. It differs from *S. leucostictos* and *pasithea* in the pale internal areas of the underside, and in the absence of most of the submarginal spots. It somewhat resembles *S. viola*, Butler; from the Celebes, but lacks the blue spots on the hindwing above.

##### *SALPINX (SELINDA) ELEUSINA*, Cramer.

Sambawa, very common. An undescribed *Isamia* occurs in Sambawa.

##### 2. *SALPINX (CALLIPLŒA) SUMBANA*, n. sp.

Above, forewing brown, slightly glossed with blue, the outer margin paler; a costal white spot, and a submarginal row of nine others, the

first six more or less fused into a single mass, the first and sixth sometimes separate, the veins dark, the fourth (above the upper radial vein) much the largest, the seventh and eighth (between the median branches) minute. Hindwing whitish costally, unmarked. *Below* uniform brown, forewing with the spots reduced, those between the median veins generally absent. Hindwing with 4-6 small inner-submarginal spots subapically, the last minute.

Sumba, coast and interior. It seems quite distinct.

*SALPINK (CALLIPLÆA) SAMBAVANA*, n. sp.

Above, forewing with seven large lilac spots centred with white, the second and last largest, the upper ones sometimes slightly connected, Hindwing with several lilac spots subapically. *Below* both wings with two nearly complete submarginal series of small and delicate white spots, the outer ones minute and not extending to the apex.

Sambawa, one of the numerous local forms of this group. A very distinct species, *C. hyems*, Butler, occurs in Timor.

I have noticed that both *C. sumbana* and *C. sambavana* are occasionally found with the first subcostal vein united to the costal one, showing at the same time the relations this group has with *Hestia*, and the small value of classifications based wholly in venation.

3. *STICTOPLÆA MELOLO*, n. sp.

Male, above rich dark brown, with blue reflections over all the forewing except the extreme outer margin; four lilac spots, sometimes centred with white, form a narrow subapical mass, the fourth well separated, generally a fifth below it, and occasionally a sixth. In the male the sex marks vary; in the specimen before me, the upper one is shorter than the lower, and only half as broad. Hindwing with two, sometimes three, subapical spots. *Below* rich brown, darker at the end of the cell and on the disc beyond it; a distinct white spot bordered with lilac at the end of the cell, and two near it in the median spaces; generally traces of a few other dots, especially subapically on the hindwing. The semicircle of spots beyond the cell of the hindwing is represented by obscure darker touches. The female is much paler.

Sumba, common; one of the numerous local forms of this genus.

4. *STICTOPLÆA LACORDAIREI*, Moore.

Sumba, common. The species was described from Java.

*EUPLÆA (TREPSICHOIS) DONGO*, n. sp.

Male, above, forewing outwardly shining blue, basally blue-black, with two rows of pale blue submarginal spots, the outer of about eight

or nine dots, not extending above the radial veins, the inner of seven large spots placed irregularly, the first four and the last three in line, the first minute. Hindwing bronzy brown with a slight bluish lustre subapically, the velvety area extending below the upper median vein. *Below* chocolate-brown, forewing with a purple cell-spot, a costal and usually three or four minute discal spots, and one or two submarginal dots near the lower angle. Hindwing with a large paler area subapically around the subcostal branches; usually a few submarginal bluish dots. The wings are short and broad, quite unlike those of *T. midamus*.

Female with no trace of blue. Above, forewing with whitish markings, one geminate in the cell, (besides a basal pale streak there), one costal, two approximate beyond the cell, three discal, two outer-discal spots, besides a few pale ones subapically and an interno-median pale streak. Hindwing with the white rays larger and more distinct than in *T. midamus*, the submarginal spots obscure. *Below*, all the markings are white and well-defined.

Nearest *T. mindanaensis*, Semper, from the Philippines, but the female and the underside of the male are very different.

Taken sparsely in the mountains of Sambawa, in the Donggo country.

##### 5. *EUPLEA* (*TREPSICHOIS*) *ELWESII*, n. sp. Pl. II, fig. 1.

Female, above brown without any blue reflections, a pale longitudinal streak in the cell, a small round whitish spot at its end, two similar discal spots between the median branches, a long bent pale streak in the upper part of the interno-median space, a subapical area of five large white spots, separated by veins only, from the costa to the upper median vein, the lower spot large and quadrate. Hindwing with four white streaks occupying the greater part of the cell, two good-sized elongate quadrate markings at the base of the spaces between the upper subcostal and the radial vein, small spots beyond the cell below the radial vein, and above the lower median, narrow whitish streaks in the submedian space, and two in the internal space. *Below*, there are obscure subapical dots on both wings, and a few marginal ones nearly obsolete. The white masses of the forewing and the hindwing are unchanged.

This species, the most aberrant of the genus, obviously mimics *Badena oberthurii*, a dominant species in Sumba. No male was seen, and only two females, both now in bad condition, were taken at Koloki and Mandas, Central Sumba, 2—3000 ft.

I name this butterfly after Mr. H. J. Elwes, the well-known lepidopterist and ornithologist.

6. *EUPLOEA* (*RASUMA* ?) *LEWA*, n. sp. Pl. II, fig. 2.

Male, above, forewing dark brown, the outer part paler, especially near the lower angle; a broad sericeous streak in the interno-median space, nearly half an inch long; a subapical mass of four blue-bordered white spots, with a minute one above them, the first two small, the third large and quadrate, the fourth smaller, pointed inwardly; a whitish point on the costa, another obsolescent discally in the upper median space. Hindwing unmarked, much paler than the forewing, especially outwardly. *Below*, forewing darkest on the disc and in the cell, the subapical band somewhat reduced in size, one bluish spot in the cell, one near the costa, and three on the disc, the lower one yellowish. Hindwing, with a space above the terminal part of the cell much darker than the rest, a pale band round the disc, one bluish spot in the cell, five or six dots beyond it, and eight rosy ones in an irregular line across the disc, two in each median and in the lower radial space, and one in each of the two next spaces. Expanse over three inches.

Sumba, apparently a dominant species. Like the next species it is separated from all allies by its white subapical band.

I did not find any species resembling this in Sambawa, though a species of *Penoa* occurs there having a somewhat similar sericeous band above. I took only a single male at 2000 feet. A wholly different species, *G. baudiniana*, Godart (*orope*, Boisduval), occurs in Timor, having the hindwing broadly whitish. *E. lewa* is apparently of Papuan affinities.

7. *EUPLOEA* (*CRASTIA* OR *VADEBRA*) *PALMEDO*, n. sp. Pl. II, fig. 3.

Closely resembling the preceding species. Male, forewing dark brown above, paler outwardly; a white, rather quadrate, subapical mass diffused at the edges, broken by three slender dark veins. Hindwing nearly white above the upper subcostal vein, the rest brown, the outer discal and subanal area much paler. *Below*, the pale areas are more obvious than in *Euploea lewa*. Forewing with a bluish-white spot in the cell, and two in the disc beyond, besides traces of two streaks in the interno-median space. Hindwing with one spot in the cell, a semicircle of six minute ones beyond it, and a row of seven or eight larger ones in the yellowish discal area, all but one arranged linearly; only one or two submarginal dots visible.

Sumba, coast and interior. It is much less common than *E. lewa*, but as the *climena* group to which it belongs is in most places a dominant one, I am unwilling to believe it a mimic of that species. The species is a very distinct one.

An allied form occurs in Sambawa, with the margins broadly

whitish as in *E. chimena*, and without the conspicuous subapical white band of the forewing.

*EUPLEA* (*CRASTIA* ?) *DEHEERII*, n. sp.

Male, above dark brown, with a slight violet gloss, the outer margin broadly paler, not glossed. Forewing with an irregular series of seven small white outer-discal spots, the first three subapical, cordate, separated by veins, the fourth and fifth beyond the line of the others, the fifth minute, the sixth and seventh in the median spaces, distinct, equal, the upper elongate; an obscure dot near the base of the upper median space. Hindwing with three good-sized white subapical inner-submarginal spots, and eight or nine obscure outer-submarginal dots, which do not reach the apex. *Below*, the cell and inner part of the disc of both wings dark brown, the rest paler, with a bronzy gloss. Forewing with a spot in the cell, one costal, four or five discal violet-white spots, seven inner-submarginal white ones arranged as above, and eight or nine outer-submarginal ones minute. Hindwing with a cell-spot, a semicircle of seven inner-discal violet-white spots, and one of nine or ten outer-discal ones, mostly white, some lilac; about twelve small submarginal white spots, larger than those on the forewing.

Like my *Euplexa oceanis* from Engano, this species has a large, somewhat velvety, pale brown patch on the underside of the forewing. This lies along the internal vein for more than half its length, about three quarters of it lying above that vein. At the base of this there is an obscure whitish patch, chiefly below the internal vein, while parallel with it is an obscure longitudinal sericeous streak placed below the lower median vein. The hindwing is whitish apically and costally, with a pale brown area surrounding the subcostal veins, entering the cell and the space below the costal vein, extending narrowly along the subcostal veins three-quarters towards the margin.

The species perhaps belongs to Mr. Moore's genus *Gamatoba*. I took it in the mountains of Sambawa, and name it in honour of my friend Heer A. C. de Heer, Controleur of Bima.

Another species from Sambawa, belonged, I think, to the subgenus *Tronga*, making ten *Euplexas* in all from that island, some very rare. Only six were taken in Sumba. At a favourable season, I believe Sumba will yield a far larger number of species than I obtained there.

8. *DANAIS* (*LIMNAS*) *CHRYSIPPUS*, Linn.

Sumba, Sambawa. Somewhat intermediate between typical *chrysippus* and *D. bataviana*; colour bright red as in *chrysippus*, the white

spot at the end of the cell absent, the black border of the hindwing broader than in Indian specimens, and inwardly diffused.

9. *DANAIS (SALATURA) GENUTIA*, Cramer.

Sumba, Sambawa. My Sumba specimens are somewhat intermediate between *genutia* and the Javanese *D. intensa*. There is only one submarginal line of spots on the hindwing above; the small subapical spots are nearly obsolete on the forewing above, and below, the red area in the upper median space is present or absent. The general colour is not so dark as in *intensa* and the species larger.

10. *DANAIS (SALATURA) LITORALIS*, n. sp. Pl. II, fig. 4, *underside*.

Male, above black, a narrow pale ferruginous band in the cell, a much larger one occupying most of the interno-median space, and another in the lower median space, extending much further outwardly, slightly irrorated with white scales in the middle; a narrow oblique white subapical macular band from the costa, the spot above the upper median vein much beyond the line of those above it; one below it, large; three costal marks, a dot beyond the end of the cell, five marginal and three submarginal spots in the median spaces, one apical and one at the lower angle, all white. Hindwing black, a broad quadrate white band across the disc, and the end of the cell as far as the lower subcostal vein, scarcely reaching the submedian scent-gland, continued outwardly by obscure ferruginous rays, the veins there widely black, an outer row of submarginal white spots, with two inner ones subapically. *Below*, forewing with the ferruginous cell-striga obsolescent, two rows of minute submarginal spots subapically. Hindwing with two complete rows of submarginal white spots, and a few costal ones, including one basally along the lower side of the costal vein, the white area more broken, its discal spots outwardly incised, the cell-spot occupying two-fifths of the cell; most of the disc, including the base of the cell and the costal and subcostal spaces, ferruginous, edged with black; the veins all dark, the submedian and internal veins black bordered with white for most of their length; the outer black border glossed with chocolate-brown.

Nearest *Danais abigar (chionippe)* from the Philippines, figured by Mr. Distant from Province Wellesley, Malay Peninsula, though that locality seems to me rather dubious. It differs in the smaller ferruginous area on the forewing and smaller white area on the hindwing. From *D. fulgurata*, *affinis*, *aruana*, etc., it differs in the absence of white in the interno-median space of the forewing.

Sumba, scarce. An apparently identical form is common on the dry coast of Sambawa.

In the figure the forewing has been drawn much too short.

**DANAIS (NASUMA) HARUHASA, n. sp.**

Male, forewing extremely long and falcate, deep fuscous above; a long obscure reddish streak extends along the lower part of the cell, another more distinct, lighter in colour, and enlarged outwardly, in the interno-median space; a third, obscure, between the lower median veins; a small round discal whitish spot in each of the spaces below the upper radial vein, the second a little nearer the base than the others are; two small whitish spots, one on each side of the lower radial vein, are sometimes present (especially in the female) just beyond the cell. Hindwing with discal streak of pale brown, slender and rather obscure, a larger one in the cell: two rows of white submarginal spots, the outer subanal only, minute, the inner obsolescent near the median veins. *Below* dark brown, the apex of the forewing rufous, the pale reddish markings of the forewing somewhat larger, those of the hindwing larger and dull leaden-white in colour, reddish only at their truncate tips, the submarginal series complete and nearly equal. Forewing with the whitish discal spots larger, those just beyond the cell distinct. An additional white spot is present near the apex, and a row of outer-submarginal dots increasing towards the lower angle, an inner-submarginal series confined to the apex. In the female three or four of the outer-submarginal dots are sometimes visible above. In the male the sex-mark is somewhat less prominent than in *D. genutia*.

Sambawa, 1000—2500 feet, scarce. When on the wing it somewhat resembles an undescribed *Euploea* found there.

Nearest *Danais ismare* from the Moluccas, but having the markings of the upperside reddish instead of white, and much reduced in size and number.

**11. DANAIS (NASUMA) TAIMANU, n. sp.**

Female. It obviously differs from the preceding species in the presence of a broad quadrate white discal band on the forewing, between the first subcostal and the upper median vein, in six pieces separated only by slender dark veins; below this there is one or sometimes two very small white spots. The submarginal spots are all obsolescent except one or two at the apex of the hindwing. The basal marks on the forewing are very indistinct, and merely paler not reddish, that in the cell absent. The discal marks on the hindwing are wholly undefined, resembling a large pale area, broken by dark veins. *Below*, there are generally one or two dots beyond the end of the cell, and also a few minute ones at the apex, one between the lower subcostal veins



more distinct, more or less bifid. The hindwing has the leaden-whitish markings rather broader than in *D. haruhasa*, but those in the median spaces are much shorter, leaving the dark outer border very wide there. The submarginal dots are in one specimen wholly absent, in the other partly present, but very small.

The male is unknown. I took one female at Lateng (1000 feet) in Taimaru, Sumba, and another at Mandas, Sumba. I fear that both are now lost. When flying it somewhat resembles *Euploea lewa*, and no doubt its mimicry of that species accounts for the presence of the broad white band, absent in *D. haruhasa* and *D. ismare*.

The subgenus *Nasuma*, as far as known, inhabits only the Moluccas, Sumba, and Sambawa, but no doubt a species will be found in Timor, while none is known from Java. It is distinguished by its elongate wings, and, at least in the two species described here, the flight is swifter than in *Danaïs genutia*, etc. It seems likely that these insects have lost some of the protective qualities of their allies, and have acquired a swifter flight and become mimics of other butterflies, the Moluccan form resembling a *Radena*, while the Sumba and Sambawa species look like *Euploea*s when flying.

12. DANAIS (TIRUMALA) LIMNIACE, Cram.

13. DANAIS (TIRUMALA) MELISSA, Cram.

Following Herr Semper's instructions, I easily separated these two species, which are extremely alike in general appearance. The *melissa*-form somewhat resembled the figure of *D. australis*, Hombroen and Jacquinot. I also recorded a form of *D. gautama* in Sumba, but no specimens have turned up. *D. limniace* and *melissa* are both common in Sumba and Sambawa.

14. DANAIS (CHITTIRA) ORIENTIS, n. sp. Pl. II, fig. 5.

Near *D. nilgiriensis*. Cell-mark of forewing with all three rays distinct, though slender, in the females, the upper two obsolescent in the male, the interno-median marks broadly divided, the mark at the base of the lower median space wanting (present in *nilgiriensis*), that in the upper median space small and diffused (large and conspicuous in allied species), the streak above the radial vein much longer than the one above it (as in *D. larissa*), five or six submarginal dots. Hindwing with the cell-spot broad in the middle (narrow in *nilgiriensis*), divided longitudinally by a slender dark line (absent in *D. larissa* and *luzonensis*), a line of six outer-discal spots in the male, nine or ten in the female, the submarginal line of spots incomplete. *Below*, both lines of spots are complete.

Pada Dalung, Central Sumba: a very dull-coloured species. It appears to belong to Mr. Moore's newly-described genus *Badacara*, along with *B. nilgiriensis*.

A single male from Sambawa agrees in the main with those from Sumba. But the whitish markings are better defined and more transparent, the outer submarginal spots of the forewing extend on the underside to the apex, the elongate discal streak between the radial veins is shorter, and all the discal and submarginal marks of the hindwing are somewhat larger and more distinct. The specimen is not now in my possession, and I am unable to compare it with *D. larissa*.

15. *RADENA OBERTHURII*, n. sp. Pl. II. fig. 6.

Male, above dark brown, the markings yellowish, somewhat translucent; a pale streak along the costal vein, the tip clavate and more distinct; the basal cell-streak bifid, its upper ray very slender, short; terminal cell-spot narrow, obliquely transverse; interno-median space with two strong white bands scarcely convergent, a broad dark space between them; a large, elongate spot in the lower median space; a broad obliquely-transverse discal band of four large white spots separated by veins, one on the costa somewhat apart from the others, the fourth largest, ovate, the third incised outwardly; another small spot beyond these on the costa, and six small inner-submarginal spots, the upper three in a line across the apex, the others small, transverse, between the upper median and internal veins; no outer-submarginal spots are present. Hindwing paler brown than the forewing, the cell all white, a large spot in each space beyond it, making, besides the long submedian streaks, four in all, the second (above the upper median vein) incised outwardly, and projecting beyond the others, the first and fourth elongate, the third small, triangular; a line of about nine inner-submarginal dots, placed rather irregularly. *Below*, similar, five or six obscure outer-submarginal dots on the hindwing only. The tufts are long, as in *R. juvena*.

Nearest *Radena purpurata*, Butler, from New Guinea, from which it obviously differs in the two interno-median streaks, and the broad oblique discal band on the forewing.

I name this fine species in honour of the distinguished entomologist, M. Charles Oberthür, of Rennes. It is a dominant species in Sumba, occurring both on the coast and inland, and seems to be the most western representative of the Papuan group to which it belongs.

16. *RADENA KAMBERA*, n. sp. Pl. II. fig. 7.

Allied to *R. juvena*, from Java. The wings are shorter, and

most of the white markings larger. The basal cell-streak is short and dusky, the outer one large, upright, the upper part projecting like the lower, a slender streak above it. The two series of subapical streaks of *juventa* are in *kamera* united into three very long white strigæ, that between the radial veins being nearly half an inch in length; all are incised outwardly; the inner-submarginal spots are large. Hindwing with the dark streak in the cell-spot continued to the end of the cell, slightly forked in the middle. *Below*, the light markings are not yellowish and greenish as in *R. juventa*, but pure white with a slight lilac gloss.

A very distinct species, not very common in Sumba.

In Sambawa there are two species of *Radena*, both I think distinct local forms. One, which appears to be the representative of *R. vulgaris*, is common everywhere; the other is very close to the Javanese *R. juventa*, and is confined to the higher country, though I have taken it as low as 1500 feet. I have now no specimens of either species, and am unable to compare them with their allies.

#### Family SATYRIDÆ.

##### 17. LETHÆ EUROPA, Fab.

A female, Sumba, 2000 feet; another, Sambawa, 4000 feet, both resembling Java specimens.

##### 18. MYCALESIS (ORSOTRIENA) MEDUS, Fab.

Sumba, Sambawa, common in meadows.

##### 19. MYCALESIS (CALYSISME) PERSEUS, Fab.

The wet-season, ocellate brood prevailed in Sumba till the middle of March, when the non-ocellate form (*blasius*) took their place. In Sambawa, the latter brood had already begun to appear in the middle of April, but a long succession of heavy rains exterminated them, and the ocellate form reappeared and continued in exclusive possession till the latter part of May.

##### 20. MYCALESIS (JATANA) WAYEWA, n. sp.

Female, above dark brown, a small ocellus on the forewing between the lower median branches. Hindwing outwardly whitish, gradually darkening inwardly, with two submarginal dark lines, a small ocellus between the lower median branches. *Below*, dark brown, slightly rufous, not perceptibly striate; a median transverse whitish line, angled at the upper median and above the submedian vein; beyond this the wing is much paler, with a rather small ocellus above the upper radial

vein, a large one above and a small one below the lower median vein; a marginal line and two wavy, dark submarginal ones. Hindwing with the outer half whitish, the dark area very sharply outlined, projecting outwardly above the upper median vein; seven ocelli nearly in line, the first, fourth, and fifth large, subequal, the second and seventh minute; beyond this are two wavy submarginal and marginal dark lines.

The male is darker and more uniform, the ocelli less marked, with a golden-brown sex-mark (as in *M. mineus*) on the submedian vein of the forewing, and a large subcostal ochreous tuft, the subcostal vein and its upper branch, slightly swollen around its bifurcation. The prehensors and sex-marks agree with those of *Calysisme* and so does its venation, except in the point mentioned.

This species occurs both in Sumba and in Sambawa, confined in both to the higher and damper regions. It is apparently the local representative of *Mycalesis mynois*, Hewitson from Timor, but lacks the conspicuous white band of that species. I also suspect it to be the local representative of *M. mineus*, but without a more elaborate study of the prehensors I cannot well prove it. *Mycalesis mynois* is the type of Mr. Moore's genus *Jatana*, the *raison d'être* of which I have not been able to discover.

## 21. *YPHTHIMA ASTEROPE*, Klug.

Sumba only, found in the driest plains. It is worth remarking that this species has prehensors precisely like those of *Y. pandocus*, the size and habits of which are so different, while the markings are nearly identical.

## 22. *YPHTHIMA LEUCE*, n. sp.

A local form of *Y. philomela*. The forewing has a large, conspicuous, whitish sex-mark, and an ocellus as in *philomela*; the hindwing has the cilia white, and the outer and abdominal region grey, with two large blue-pupilled ocelli and two minute anal ones. *Below*; the stræ are very irregular; the forewing has a whitish discal band partly inclosing the large ocellus, and extending to the hind-margin; there is a submarginal dark band, the apex and costa are dark. Hindwing chiefly white, the disc being free from stræ over a considerable area, and elsewhere they are very delicate and irregular, forming an obscure transverse fascia, crossing the cell near its end, and a continuous, slender submarginal line. The six ocelli are in pairs, as in *Y. philomela* or *sepyra*, all black, pupilled with blue, and with large ochreous irides.

This species is found in Sumba and Sambawa. It may also be allied to *Y. aphnius* (Timor) of which only the dry-season form is known.

In that case it bears much the same relationship to *aphnius* as *Mycalesis wayewa* does to the Timorese *M. mynois*, the orange band of the hind-wing of *T. aphnius* being absent.

Mr. de Nicéville has shown me that the true *Ypthima philomela* of Johanssen has no sex-mark. Since that is the case, the Indian form will stand, I suppose, as *Y. baldus*.

23. MELANITIS CONSTANTIA, Cram.

Sumba, Sambawa, not uncommon on the dry coast. A Sumba female before me has the ochreous band narrow and irregular, almost attaining the costa and the lower angle, its outer border undefined, with three obscure ocelli (the first chiefly white, the last nearly all dark), the outer border with three indentations, and projecting acutely inwardly along the lower median vein. Hindwing with two ocelli, the apical border narrowly ochreous. *Below*, the ocelli are rather small, the aspect that of *M. leda*, the wet-season form.

24. MELANITIS LEDA, Linnæus.

The dry-season brood (*ismene*) appeared in Sumba in the middle of March, in Sambawa in the middle of May; till that date the ocellate brood held the field.

Family ELYMNIADÆ.

ELYMNIS UNDULARIS, Drury.

Sambawa, low country, not differing from Java specimens. No *Elymnias* is known from Sumba or Timor.

Family MORPHIDÆ.

A *Discophora (timora)*, Wallace) has been found in Timor, but I saw none of the family either in Sumba or Sambawa.

Family BYBLIADÆ.

25. ERGOLIS ARIADNE, Linn.

Sumba, Sambawa, not differing from the Indian form, hardly so small and dark as the Javanese. I believe *E. merione* also occurs in Sambawa.

Family APATURIDÆ.

26. CYNTHIA DEIONE, Erich.

A single male, Sumba, interior. Common in Sambawa, where the females vary to a remarkable extent, some being as red as the male,

while others are dark green insects like *parthenos*. Intermediate forms are common.

27. *CETHOSIA PENTHESILEA*, Cram.

Sumba and Sambawa, common, even on the coast. A single female taken in the interior of Sumba was very large and richly coloured, resembling the female of the Javanese *C. hypsea*, Doub., but I am not sure that it was distinct from *C. penthesilea*.

*CETHOSIA TAMBORA*, n. sp.

Black, the usual wavy submarginal lines absent on both wings. Forewing with an irregular ochreous subapical band of six marks, the first two slender, minute, the third elongate-quadrate, the fourth very small, triangular, the fifth long and narrow, the sixth large, triangular, paler; a dull reddish area on the hind margin and basally in the internomidian space, two or three reddish touches basally in the cell. Hindwing, basal half red, a small dark spot discally between the costal and the subcostal veins, and one between the subcostal branches. *Below*, all blue-black and ochreous-white, except a reddish area on the hind margin of the forewing.

The description, which is apparently that of a female, is a poor one, but I believe several specimens of both sexes are in Mr. Neumoege's possession. It is very unlike any known species.

Sambawa, mountains, scarce. I have named it after the great Sambawan volcano, celebrated for its eruption in 1815.

I have dubiously recorded a similar species in Sumba, not taken, the underside more variegated.

Two very beautiful species, *O. lamarckii* and *leschenaultii*, were taken by Mr. Wallace in Timor, but neither seem to extend further westwards.

28. *CUPHA ERYMANTHIS*, Drury.

Sumba, Sambawa, normal. No *Oirrhochroa* was seen in either island, nor has any been recorded from Timor. .

29. *ATELLA PHALANTA*, Drury.

Sumba, Sambawa. Sumba specimens are richly marked with purple below.

30. *ATELLA SINHA*, Kollar.

Sumba, Sambawa, normal.

31. *CYRESTIS NAIS*, Wallace.

Two tattered specimens from Pada Dalung in Sumba seem to be

almost precisely intermediate between *O. nivea* and *O. thyodamas*. To indicate their affinities would require a long description. They seem near Mr. Wallace's *O. nais* from Timor, but without better specimens I cannot be sure of their position.

SYMBRENTHIA HIPPOCLŪS,\* Cram.  
Sambawa, none taken.

32. PYRAMEIS CARDUI, Linn.  
Dry meadows, Sumba.

33. JUNONIA ATLITES, Joh.  
Sumba, Sambawa.

34. JUNONIA ASTERIE, Linn. var., SUMBÆ.

Above, the subapical ocellus is indistinct, merged in the black band from the costa; the lower ocellus is large and set in a black patch. On the hindwing the lower ocellus is much larger than in Indian specimens of *asterie*, and is marked like the upper one. *Below*, the forewing has only two ocelli, the upper pair on the hindwing are more perfectly merged into one, the black transverse lines are replaced by diffused pale reddish ones; the hindwing has three pale bands across it.

Sumba, Sambawa, common. It is merely an extreme form of the Java variety (*J. javana*, Felder), which connects it with the typical Indian one, differing chiefly on the underside.

The non-ocellate form, *J. almana*, probably conspecific with *asterie*, was not taken.

35. JUNONIA VELLIDA, Fab.

The upperside agrees with Godart's description. The underside is rather brilliantly marked with black or fuscous wavy lines on a pale grey ground, a reddish submarginal band, the hindwing with five ocelli, of which only the second and fifth are distinct, pupilled with bluish.

This pretty little species occurred only on the desert plains of Sumba, and seemed to be rare.

36. JUNONIA AONIS, Linn.

The markings of the forewing are rather fuscous than fulvous except the ocelli, of which only two are distinct, the lower small and attached to the upper. On the hindwing the second of the five ocelli

\* In Eastern Java I found that the female of this butterfly was dimorphic, one form having the yellow spots replaced by white ones, so that it resembled a white *Neptis* instead of a yellow one. No intermediate forms were seen.

is larger than the others. Otherwise the specimens agree with Godart's description. In the female there are distinct reddish-bordered ocelli on the forewing, and the sordid spots are larger. The underside is sometimes reddish, as is often the case with the female of *J. lemonias*. There seem to be two perfectly distinct seasonal forms, that of the dry-season resembling a dead leaf below.

Sumba, Sambawa, those from the latter island not examined. The species is certainly very close to the Javanese *J. erigone*.

37. *JUNONIA TIMORENSIS*, Wallace.

In the male there is no distinctly rufous area except a submarginal band on both wings, evanescent apically on the forewing. In some females nearly the whole upper surface is more or less rufous, outwardly brighter, a dark area over the apex and disc of the forewing, the subapical spots united, a small distinct ocellus (obscure in the male) between the lower median branches. *Below*, the male is dark with the ocelli distinct, while the above-mentioned females are glossed with silvery-grey scales over both wings, obscuring the subapical band and the ocelli, the median transverse line distinct, angled at the upper median vein. These females evidently belong to the dry-season brood, just appearing at the time I left Sumba, and resembling the other form much as *J. almana* resembles *asterie*. I have not observed any male of this brood.

Sumba. This very distinct species, as Mr. Wallace justly calls it, was previously known only from Timor,

38. *JUNONIA ORITHYIA*, Linn.

Sumba, Sambawa.

39. *PRECIS IDA*, Cram.

Sumba, Sambawa.

40. *PRECIS IPHITA*, Cram.

Sumba, Sambawa.

41. *YOMA SABINA*, Cram.

Sumba, Sambawa, low country.

I see that Doubleday, followed by M. Oberthür and Dr. Semper, places this species in the very heterogeneous African genus *Salamis*, the type of which somewhat resembles a *Doleschallia*. The only species of *Salamis* at all like *Yoma* are *S. anacardii* and *anteva*, forming Wallengren's genus *Protogoniomorpha*, a name which ought to be barred on account of its enormous length. But in these species the cell of the



hindwing terminates opposite the second forking of the median vein, in Yoma at some distance before it. The relations of homologous genera in different zoological regions are as yet very little known, and will no doubt greatly exercise the minds of naturalists in the next century. But for the present I think my genus *Yoma* may be allowed to stand.

42. *HYPOLIMNAS MISIPPUS*, Linn.

Sumba, Sambawa. The female mimics *Danaïs chrysippus* as usual.

43. *HYPOLIMNAS BOLINA*, Linn.

Sumba, Sambawa. The female sometimes has a red area near the hind margin of the forewing and over the disc of the hindwing.

44. *HYPOLIMNAS SAUNDERSII*, Wallace, (?).

Several broken specimens of what appeared to be a dwarf form of *H. pandarus* were taken in Sumba, but none have survived.

*HYPOLIMNAS ANOMALA*, Wallace.

One male, taken in the mountains of Sambawa. I am unable to say whether it was identical with Javanese specimens or not.

45. *DOLESCHALLIA* sp.

At least one species occurs in the dry coast region of Sumba, but no specimen was taken.

46. *HEL CYRA CHIONIPPE*, Felder.

Several specimens seen at Pada Dalung in Sumba, but none taken.

47. *CHARAXES ATHAMAS*, Drury.

Sumba, Sambawa.

48. *CHARAXES* sp.

A very large *Charaxes* apparently of the *eudamippus* group was several times seen in the mountains of Sumba, and again in those of Sambawa. Unlike *C. eudamippus*, which is a ground butterfly, it always alighted high up on trees, so that I could never catch it. Another species, something like *C. pyrrhus*, was once seen in Sumba.

### Family NYMPHALIDÆ.

49. *PRÆDYMA COLUMELLA*, Cr.

Sumba, Sambawa. The upper band of the hindwing above is much broader than in Indian specimens.

50. *NEPTIS HORDONIA*, Stoll.

Sumba, Sambawa. The yellow markings above are all much smaller than in Indian specimens.

51. *NEPTIS NANDINA*, var. *SUMBA*.

This form greatly resembles the Javanese *N. leucothoë*, a near ally of the Indian *N. varmona*, but the triangular white spot beyond the cell is narrow and elongate, sometimes extending on the underside two-thirds towards the margin. The subapical white band is somewhat less massive, and the four large discal spots are separated by veins, the first clongate, as large as any of the others. The upper band of the hindwing is narrower, the submarginal lines remoter from the margin. The general colour of the underside is dark red, the white bands very slightly outlined with dark. Though the markings resemble those of *N. leucothoë*, the species is probably more allied to *N. nandina*. From this it may easily be distinguished by the brilliant white markings of the upperside. The discal spots are large, that between the upper two median veins large and elongate, the cell-streak is well separated from the triangular spot beyond the cell. The upper band of the hindwing is narrower, especially apically.

Sumba; a somewhat different form occurs in Sambawa, which I am now unable to examine. I did not observe any representative of the *varmona* group in Sumba.

52. *ATHYMA PERIUS*, Linn.

Sumba, Sambawa. As in India it generally occurs in open meadows, unlike all its allies.

53. *ATHYMA KARITA*, n. sp.

Male, above deep brown, variegated with darker areas, forewing with an outer-submarginal pale line, and an inner-submarginal series of slender obsolescent greenish streaks. An oblique subapical band of three greenish-yellow spots, the second largest, adjacent to the first, the third as large as the first, round, separate; cell unmarked; a broad discal macular band from the hind-margin to the second median vein, with a small triangular spot above it, that between the two lower median veins rounded-quadrate, as large as the one below it, separated from it only by a vein, and projecting beyond it. Hindwing with two greenish-yellow bands, the upper unbroken, very wide on the costa, extending to the submedian vein, where it tapers to a point; the lower band composed of six transverse spots cut by dark veins, their lower edges incised, the outer ones slender, lunular. Below the markings are similar, but whiter and more united, placed on a dull brown ground, a

darker chocolate area discally on the forewing, a row of obscure darker submarginal spots on the forewing, and discally on the hindwing; the abdominal margin of the hindwing is broadly suffused with bluish.

Sumba, a single male taken by the river Waibaku near Pada Dalung, at 1,500 feet. The species seems intermediate between *A. venilia* and *A. amhara*.

#### *ATHYMA NEFTE*, Cram.

One male taken near Ndindi, Sambawa, at 3000 feet elevation. It is one of the apparently numerous Indo-Malayan species inhabiting the mountainous interior of this island.

#### 54. *LIMENITIS*\* *PROCRIS*, Cram.

Sumba, Sambawa.

\* I append the description of a very rare species from Perak, Malay Peninsula, allied to *L. daraza*.

#### *LIMENITIS AGNEYA*, n. sp.

Male. Above very deep fuscous, a pea-green band across both wings. Base of forewing somewhat paler, with obliquely transverse darker markings in and below the cell: a submarginal pale line, an outer-discal row of six dark spots set in square paler spaces. The green band extends from the hind margin to the upper median vein in four spots separated by dark veins only, the upper spot a little out of line and smaller. Beyond these a line of three smaller spots runs to meet them obliquely, placed at right angles with the costa, extending from the upper median to the subcostal, the upper smaller than the others and whitish, placed above the inner half of the middle and largest one. More than halfway between these and the apex are two other spots also placed at right angles with the costa, and between the third and fifth subcostal veins, the lower small, greenish, the upper very small, whitish. On the *hindwing* the green band extends from the costa, where it is widest, to the submedian vein, tapering to a point. Its inner margin is convex, its outer straight; it is whitish at both ends and cut by slender black veins. The submarginal pale line and the outer-discal line of spots are much as on the forewing; cilia white, dark at the ends of the veins. *Below* light chestnut-brown, the band as above, but paler green and not cut by dark veins, the basal marks on both wings outlined with lilac, the outer-discal line of spots set in lilac areas, the submarginal line lilac, some darker red discal markings beyond the green band.

Obviously differs from *Limenitis daraza* in the bird green band of the forewing; agrees with it in the closed cells of both wings, which make the positions of the species in this genus rather dubious. My single male of *agneya* was taken on Larut Hill, Perak, at about two thousand feet elevation. *L. daraza*, not apparently differing in any respect from the Himalayan form, was not uncommon at the summit of the same hill, nearly three thousand feet higher.

Prehensors, seen from the side. In *agneya* the uncus is long, sinuous, hooked at the tip, without branches, the clasp simple, straight, tapering gradually to the

*LIMENTIS HOLLANDII*, n. sp.

Male, above, black; cilia alternately black and white, a double undulating submarginal pale line, touched with whitish apically on the forewing; two united white spots placed obliquely subapically above the radial veins, with or without a smaller one below them. A broad common white band, very slenderly cut by dark veins, edged outwardly with purple, across both wings, extending on the forewing nearly to the upper median vein, the upper (fourth) piece small, the inner edge of the band straight, the outer irregular. Hindwing with the white band extending to the submedian vein, where it is tapering, both its edges nearly straight. *Below* chestnut-red of two different shades, the basal two-thirds of the cell mostly white, with a crooked dark mark, an irregular white spot at the end of the cell, its lower side tapering; the white band extends nearly to the lower radial vein; two submarginal pale lines, the inner mostly bluish-white with three white subapical spots; a chestnut longitudinal streak in the internomidian space. Hindwing with the two submarginal lines regular, grey, undulating, base chiefly white with transverse streaks of chestnut, namely, two in the cell, two between the costal and the first subcostal vein, one along the precostal vein; and a long one from the costa tapering to the submedian vein; the white band broad. It is rather a small species.

Several males taken in the Do Donggo country, Sambawa, all above 2000 feet. The species is nearest *L. lysanias* from the Celebes, but is without the rufous bands which that species has on the upperside.

I name the butterfly in honour of the Rev. W. J. Holland, of Pittsburgh, U. S. A., well-known as a lepidopterist.

55. *SYMPHÆDRA EGLE*, n. sp.

Male, above black, with some obscure ochreous-greenish spots near the costa, and three in the cell (two at the end), two in the internomidian space, one basal, the other further out, geminate; a row of five white subapical spots in a semicircle above the middle median vein, the second largest, then the first, the third diffused; also a macular submarginal band of dull bluish-whitish spots (the lower two sagittate) extending from the hind margin nearly to the apex, separated by dull

tip. In *L. populi* the tip is abruptly bent downwards. In *daraza* the tip is blunter than in *agneya*, and there is a long process arising from its upper edge, longitudinal and slightly ascending, set with denticles on both sides. The uncus is also shorter. The lower uncus, absent in most butterflies, is well developed in this genus, strongly hooked at the tip, its point opposed to that of the true or upper uncus, which can be brought into contact with it by muscular action.

bluish-green spaces. Hindwing with a broad bluish-green band from the abdominal margin (where it is whitish) to the costal vein (where it is blue), consisting of spots twice as long as wide, separated by black veins, their inner border diffused, the outer pointed, enclosing a large oval or cordate black spot, slenderly surrounded with blue. *Below*, forewing nearly black, slightly olivaceous apically, the markings white, more or less tinged with greenish or ochreous, arranged in two series, a submarginal one of five or six spots, and a discal one of seven, of which the third is evanescent, the fifth and sixth obliquely elongate, the seventh geminate and purplish; there are also spots on the inner disc, between the median veins and above each radial; cell crossed by two bluish-white bands, one in the middle, one at the end, with several additional spots at the base. Hindwing purplish-brown with a slight bronzy lustre; a submarginal band of dark spots in paler spaces; an irregular discal series of pale spots, three spots in the cell. Eyes dark, proboscis scarlet.

The colour of the underside, the narrow and dull blue band, and the numerous spots on the upperside distinguish it from *S. dirtea*.

A male, Pada Dalung, a female, Mandas, both in Sumba. I have no description of the female.

An *Euthalia*, dark like *E. garuda*, seems also to inhabit Sumba, but none were taken.

### Family LIBYTHEIDÆ.

#### 56. LIBYTHER GEOFFROYI, Godart.

Two males, interior of Sumba. The blue of the forewing almost obliterates the subapical spots, which are barely traceable above; the luteous band of the hindwing is very obscure.

#### 57. LIBYTHER NARINA, Godart.

One female, interior of Sambawa, another seen in Sumba, not taken. The Sambawan specimen agreed well with Moluccan examples; The Philippine form has the white band of the hindwing reduced, while the Assam variety (*L. rohini*, Marshall); has it enlarged.

### Family NEMEOBIADÆ.

#### ZEMEROS PHLEGYAS, Cram.

Sambawa, scarce. No species of this family was observed in Sumba.

Family LYCÆNIDÆ.

Subfamily THECLINÆ.

58. ARHOPALA ARAXES, Feld.

Sumba, coast. A local Celebesian form of *A. amantes*, but apparently distinct.

FLOS APIDANUS, Hew., var.

Sambawa, 3000 feet.

SURENDRA QUERCETORUM, Moore.

Sambawa, coast.

Subfamily APHNEINÆ.

IRAOTA TIMOLEON, Stoll.

Sambawa. I am almost inclined to think this species a mimic of the white species of *Neptis*; the resemblance is sometimes quite striking, and at any rate the *varmona* group of *Neptis* is partially protected.

59. CURETIS MALAYICA, Feld., var. KIRITANA.

Male black, the red area scarcely extending above the middle median vein, the hind margin dark. Hindwing with the end of the cell and the disc from the subcostal vein to about the lower median, red or reddish, the abdominal and costal margins very widely, the outer margin more narrowly black.

Sumba, Sambawa, scarce. This is, I think, the darkest *Ouretis* known, Dr. Felder's *O. obscura*, described as a male, being really a female.

60. HYPOLYCÆNA SIPYLUS, Feld.

Sumba, Sambawa. This is near Dr. Felder's *H. thecloides*, but the lower part of the hindwing above is bluish, not ochreous.

61. LOXURA ATYMNUS, Linn.

Sumba, Sambawa. Two or three more species of the *Aphnæinae* were taken in Sumba, but the specimens are now lost.

Subfamily DEUDORIGINÆ.

62. RAPALA IARBAS, Fab.

Sumba, Sambawa, mountains.

RAPALA ORSEIS, Hew.

Sambawa, 1,500 ft., a male and a female.

63. *RAPALA VARUNA*, Horsf.

Sumba, Sambawa, mountains. I also observed a species of *Sinthusu*\* in Sambawa, but no specimens were taken.

Subfamily *LYCENINÆ*.

c. *CYANIRIS AKASA*, Horsf.

Sambawa, 4-5000 feet, rare.

64. *CYANIRIS PUSPA*, Horsf.

Sumba, Sambawa, mountains. The white area is larger than in Indian specimens, extending over three or four spaces and into the cell. The female has the white areas very large and not marked with blue.

65. *ZIZERA PYGMÆA*, Snellen.

Sumba, Sambawa.

66. *ZIZERA LYSIZONE*, Snellen.

Sumba, Sambawa. Another *Zizera* occurred in Sumba.

\* I append the description of a rare Javanese species of this genus.

*SINTHUSA ASPRA*, n. sp.

Male, above, forewing with the costa and the outer margin narrowly black, the base as far as the end of the cell, and more especially the basal half of the interno-median space to the hind margin, light violet-blue; a diffused submarginal macular band of the same colour; the disc and the outer half of the hind-margin black, deep blue in some lights, with a few scattered light-blue scales. Hindwing violet-blue, (much richer than on the forewing) from the lower subcostal to the submedian vein; above the lower subcostal vein a line of pale blue scales; the abdominal border widely silvery-whitish. Below, white, the spots chiefly very small, black, not annular as in all the allied species; a broad dark fascia across the end of the cell of the forewing; six discal spots, the upper three small, in an oblique line, the lower three larger, in a transverse line nearer the base; a slender marginal dark line, cilia dark. Hindwing with the cell-fascia double; eight discal spots, the fifth evanescent and nearer the base, the eighth elongate and conspicuous; a large black spot in the lower median space; in the next a blue area adjoining the black lobe; beyond this a short black and blue marginal line; tail chiefly black. The prehensors resemble those of *Deudorix*.

The hindwing is angled at the end of the middle median vein; there is a short tail and a very small but distinct lobe. The venation and sex-marks are as in other species of *Sinthusu*. The species has no near allies.

Rare on Arjuno, Eastern Java, taken at 5000 feet in a flock of *Cyaniris akasa* from which it was indistinguishable when settled. The genus is usually mimetic. *S. nasaka*, Moore, strongly resembles *Hypolycaena eryllus*, and I have several times mistaken *S. virgo*, Elwes, for a *Cyaniris*.

I have given Mr. de Nicéville the type of this species. The specific name means white in modern Greek.

67. *POLYOMMATUS BATICUS*, Linn.

Sumba, Sambawa, high country.

68. *CHILADES TROCHILUS*, Freyer (*putli*).

Sumba, Sambawa.

69. *EVERES PARRHASIUS*, Fab.

Sumba, Sambawa.

70. *TARUCUS THEOPHRASTUS*, Fab.

Sumba.

71. *TARUCUS PLINIUS*, Fab.

Sumba, Sambawa.

72. *CASTALIUS ETHION*, Doub.

Sumba, Sambawa.

73. *CASTALIUS ROSIMON*, Fab.

Sumba, Sambawa.

74. *CASTALIUS ROXUS*, Godt.

Sumba, Sambawa.

75. *CATOCORYSOPS CNEIUS*, Fab.

Sumba.

76. *CATOCORYSOPS PANDAVA*, Fab.

Sumba.

77. *CATOCORYSOPS STRABO*, Fab.

Sumba, Sambawa.

78. *NACADUBA GAURA*, n. sp. Pl. II, fig. 8, *magnified two diameters.*

Male, above, pale violet, a narrow black border widening apically, the veins brown. Hindwing with a row of six black spots in whitish rings, a marginal dark line, cilia chiefly white. *Below* pale brown, heavily marked with white. Forewing with a serrate, catenulated line of dark spots, surmounted by a row of lunules outwardly whitish, inwardly dark; three transverse quadrate dark bands, paler in the middle, and bordered with white, namely, two in the cell, the basal one continued into the interno-median space, and a broader one across the



wing discally to the submedian vein, slightly dislocated inwardly at the upper median vein, below which it is narrow and broken. Hindwing with a row of serrate ocelli as on the forewing, a very large black ocellus in the lower median space, slenderly edged with dark orange, and then a darker ring; a black anal spot; the three transverse bands much broken, the discal one forming two dark quadrate areas, the upper from the costa to the lower subcostal vein, the lower lying further out, extending thence to the upper median vein; the disc is chiefly white.

This curious species\* is something like Dr. Felder's *Lycæna palmyra* from Amboina. The venation places it in *Nacaduba*, but it has little resemblance to the usual forms of the genus, and looks more like a *Catochrysops*.

Sumba, rare.

79. *NACADUBA LAURA*, n. sp, Pl. II, fig. 9, ♀, magnified two diameters.

Female, above, forewing about three-fifths dark brown; a large white area, sprinkled, especially at the base, with blue scales, extending from the cell to the hind-margin. Hindwing with the cell and the two spaces beyond it discally white, the rest of the disc paler brown; two submarginal rows of black spots, the outer round, the inner lunular. *Below*, forewing with a large white area occupying the end of the cell and the disc to the hind-margin; a basal transverse dark band across the cell and the interno-median space; the discal transverse bands are obliterated, except costally, one being represented by two brown lines extending from the hind margin into the white area as far as the middle median vein. Hindwing with the white area much smaller and duller-coloured, the transverse bands confused. Both wings have two submarginal rows of conspicuous dark spots, the inner large, black, semicircular on the forewing, lanceolate on the hindwing, the outer paler, transverse. The hindwing has two slender ocelli with slender irides of orange, touched with metallic, the outer one with the black area very large.

\* An allied species, of which *N. gaura* is presumably a local form, occurs in south-eastern Borneo and Java. I also took a male in Engano (unluckily omitted in my list), and I think I found it in the Nicobars. A Bornean specimen before me has the black marginal band above very narrow and equal, the black spots on the hindwing obsolete, except that in the lower median space, which is large. *Below* there are no distinct white areas, but all the markings are conspicuously edged with white. The discal band is bent outwardly and very irregular as far as the middle median vein, below which it is broad, straight and quadrate, the subanal ocellus is broadly bordered with orange.

I propose the name of *N. pœustus* for this species.

I took several females in Sumba, both on the coast and in the interior, and also a single male probably of this species. It was violet blue above, the margin very slenderly dark. Below the white areas were nearly obsolete on the forewing, and on the hindwing reduced to a white bar in the band across the end of the cell, and a border one on the disc beyond the cell between the lower subcostal and upper median veins. Expanse over an inch and a quarter.

The species is near *N. perusia*, Felder, from Amboina, and *N. atrata*, Horsfield, from Java, but the extensive white areas of the female easily distinguish it.

80. *NACADUBA HERMUS*, Feld. (*viola*, Moore).  
Sumba, Sambawa.

81. *NACADUBA ARDATES*, Moore.  
Sumba, Sambawa.

82. *NACADUBA MACROPHALMA*, Feld.  
Sumba. The female is marked almost as in that curious little species, *N. kerriana*, Distant, which I have taken at 4000 feet elevation in Karenni east of Burma.

83. *NACADUBA DANA*, de Nicéville.  
Sumba, Sambawa. This is probably Mr. Druce's *N. almora*, but his figure and description are so bad that certainty is impossible.

84. *LAMPIDES BOCHUS*, Cram. (*Jamides bochus*).  
Sumba, Sambawa, rare. The only Sumba specimen I have examined has the blue area above very large, and not at all brilliant. It may be a distinct local form of this species, intermediate between *L. bochus*, Cram. and *L. astraytes*, Feld.

A *Lampides* which occurs in Borneo, Sumatra and the Malay Peninsula but has apparently escaped the notice of naturalists, has the underside like that of *L. bochus*, while the upperside has only a slender marginal dark line and is of a rich blue, darker than that of *L. elpis*. I have given Mr. de Nicéville a Bornean example for description.

85. *LAMPIDES ANOPS*, n. sp. Pl. II, fig. 10.

Male, above, rich azure-blue, violet in some lights, darkening outwardly, translucent, a slender marginal dark line somewhat broader apically on the forewing, the cilia of the hindwing white. Below, ground-colour basally grey, darkening outwardly, but without the slightest

rufous tinge. The markings consist of slightly darker transverse bands, bordered by straight white lines, which are broad and very conspicuous. Forewing with one of these across the cell, with no markings above it costally, one discal from the costa to the middle median, then dislocated inwardly and continued obliquely to the lower median, below which the wing is white with a single dark streak in it. Hindwing with the bands confused and broken. Both wings have the cilia whitish, a marginal dark line, a catenulated line of dark streaks in a white ground, and behind this a line of very conspicuous black lunules, large and lanceolate on the hindwing; behind these are white lunules which extend far into the disc. There is no trace of ocelli, or of metallic scales.

The female is also blue, and has the outer two-thirds of the forewing black above.

Sumba, confined to the mountain-forests above 2000 feet. A beautiful and conspicuous species. I have not examined the prehensors, but the species is so unlike all others that its identification must be easy. In the figure the white markings of the underside have been made too narrow and inconspicuous.

86. *LAMPIDES MASU*, n. sp. Pl. II, fig. 11.

Male, above, bluish-white, whiter than *L. alianus*, a very slender marginal black line nearly obsolete apically; hindwing with this line more distinct; a broken, catenulated, submarginal dark fascia, double at the anal angle, obsolete apically, with a good-sized dark spot in the lower-median space. *Below* pale brown, the bands scarcely perceptibly darker, bordered by white lines, of which the basal pair on the hindwing are slender; on the forewing one band crosses the cell, one is beyond it from the costa to the middle median vein; these two are continued in common by another nearly to the hind-margin. On the hindwing the bands are irregular, extending further outwardly than in *L. anops* (in which the submarginal lunules greatly encroach on the disc), acutely angled in the interno-median space. Both wings have three conspicuous white submarginal lines enclosing two lines of spots, the outer linear, catenulated, slender, the inner large, black and conspicuous, transverse and wholly surrounded with white on the forewing, lanceolate and irregular on the hindwing. Hindwing with a large subanal ocellus with a narrow orange iris, surmounted by a black and a white lunule; a small similar anal ocellus; both are touched with metallic.

This species is very like the Amboina female figured by Cramer as *aratus*, and is probably a local variety of that species. The female of *L. masu* has the black border of the forewing broad and serrate apically, the inner cordate spots of the hindwing are large and black. The

male differs from *L. subditus*, Moore, in the whitish upperside, and in the pale underside, heavily marked with white, with the orange area smaller; it resembles it in the submarginal band of black spots. *L. subditus* is very close to *L. amphissa*, Felder, from Amboina.

87. *LAMPIDES CELENO*, Cr.  
Sumba, Sambawa.

88. *LAMPIDES ELPIS*, Godt.  
Sumba, Sambawa.

89. *SPALGIS EPIUS*, West.  
Sumba, Sambawa, found on the acacias growing along the dry shore, the specimens normal.

90. *MEGISEA MALAYA*, Horsf.  
Sumba, Sambawa.

91. *NEOPITHECOPS ZALMORA*, Butler.  
Sumba, Sambawa.

#### Subfamily *GERYDINÆ*.

92. *GERYDUS TEOS*, n. sp.

A local form of *G. symethus*. The white area above is large, extending furthest below the middle median vein; there are no bluish scales; the upper median vein is swollen at its base. Hindwing all dark, not bluish-grey as in *symethus*. Below nearly uniform pale brown, a dark area crossing the end of the cell, surrounding the median vein and its branches discally; beyond this there is a whitish area from the middle median vein to the hind-margin; the transverse discal lunular band only extends down to the middle median vein. Hindwing with the discal lunules nearly joined, very distinctly marked, scarcely darker than the ground-colour, edged with paler. Both wings have a submarginal dark line edged inwardly with whitish, and containing a black dot in each space. The underside is wholly without the sordid irrorations found in *G. symethus*.

The female has a little less white on the forewing above, and a little more white below. The hindwing is acutely angled in the middle and is unmarked above.

Sumba, Sambawa. The Javan form (*G. pandu*, Horsf.) may also be distinct from *G. symethus*.

93. *GERYDUS BOISDUVALII*, Moore, var. *ACRAGAS*, nov.

Male, above, forewing with the base of the upper median vein swollen beyond the cell and placed in a small longitudinal pale space, no other markings above. Female with a narrow straight white band beyond the cell, extending obliquely to the lower median vein, broken by the dark middle median vein. *Below*, forewing, with a white area over the disc to the hind margin, the transverse discal band formed of joined incomplete lunules in both sexes. The female has the hindwing slightly angled.

Sumba, Sambawa. I cannot compare this with the Javanese form, the male of which is still undescribed. But the shape of the band in the female of *G. acragas*, which resembles that of the male of *G. biggsii*, the absence of white or pale markings above in the male, and of sordid irrorations on the underside in both sexes, easily distinguish it from the Indian form of *G. boisduvalii*. It is obviously distinct from a form mentioned by Mr. Distant, who says "in an Amboinese species *G. boisduvalii*, Butler, the distinctive colouring of the anterior wing is reversed, the male having the largest white area to the anterior wings."

The male of *acragas* must certainly be very much like that of *G. irroratus*. Dr. Semper doubtfully identifies with that species a Philippine form having a large round median white patch in the female. I think this very unlikely to prove correct. *G. irroratus* is certainly very close to *G. boisduvalii*, but till the female of Mr. Druce's Siamese form is discovered, the question must be left open.

## Family PIERIDÆ.

94. *NYCHITONA XIPHIA*, Fab.

Sumba, Sambawa, varying greatly in size and markings.

No *Elodina* was seen in either island, though *E. egnatia* is known from Timor.

95. *TERIAS HECABE*, Linn.

Sumba, Sambawa, several varieties.

96. *TERIAS SARI*, Horsf.

Sumba, Sambawa.

*TERIAS DEONA*, Horsf.

Sambawa, 2-4000 feet. *T. candida*, found by Mr. Wallace in Timor, was not seen.

97. *TERIAS HARINA*, Horsf.

Sumba, Sambawa.

## HUPHINA TEMENA, Hew.

Sumbawa. A very beautiful species.

## 98. HUPHINA JULIA, n. sp. Pl. II, fig. 12.

Male, above, creamy-white, a black marginal fascia, scarcely wider on the forewing than on the hindwing; its inner border diffused; the submarginal dark bands of the underside visible through the wings; all the veins of the forewing dark, as well as those of the hindwing outwardly. *Below*, forewing white, a submarginal diffused brown band, connected along the two upper median veins with a dark longitudinal band in the lower part of the cell; apex diffused ochreous-yellow, the yellow area just crossing the submarginal band costally, the outer margin narrowly brown. Hindwing bright yellow; a narrow dark marginal band, a broad, irregular, serrate dark submarginal band enclosing seven large orange-scarlet spots, obsoletely edged with yellow; the subcostal space nearly all scarlet, without any black border inwardly or outwardly. Expanse two and two-third inches.

Female, above, forewing with all the veins heavily outlined with dark, the spaces more or less white, a united subapical white band, and a row of submarginal spots. Hindwing pale yellow, the veins slightly darkened, a broad outer dark band enclosing white spots. *Below*, duller than the male, the radial and upper median veins of the hindwing marked with lines of blackish scales.

Nearest *H. lata*, Hewitson, from Timor, which has the forewing broadly and the hindwing slenderly black above, while below, the disc of the hindwing is uniform black, the submarginal dark band of the hindwing is obsolescent, and the scarlet costal stripe bordered on both sides with black. It is a much smaller butterfly than *H. julia*.

Sumba, interior.

This insect, the most beautiful Oriental species of *Pieris* known, has when flying none of the air of a protected butterfly. If it stood alone, I should certainly suppose it to be a mimic of some form of *Delias hyparete* yet undiscovered in the island. But both *H. lata* and *H. temena* require to be accounted for in the same way, and while it is possible that some Timorese *Delias* may resemble *H. lata*, I feel sure that *H. temena* can have no such original. It must then be assumed that this group is less pressed by its enemies in the Timorian Islands, and has therefore been able to acquire more brilliant colours than its allies.

*Huphina lata, julia, temena* and *tamar* form the nearest approach to a peculiar group of butterflies which these islands possess. But *H. tamar* is from Bali, beyond Wallace's Line, and no doubt extends into Eastern Java.

HUPHINA NAOMI, Wallace.  
Sambawa.

99. HUPHINA EIRENE, n. sp.

Male. It differs from *H. naomi* in the colour of the hindwing below, and that of the subapical spots of the forewing, being lemon, instead of rich orange-ochreous. Above, the median vein and its upper branch are more widely marked with black, and the white of the cell and the hind margin of the forewing is clearer and purer.

In these points it agrees with *H. judith*, Fab. (Java), but differs in the narrow dark markings of the forewing above, the long white discal markings being slenderly continued nearly to the margin. *Below*, the forewing has three subapical lemon spots, a large white spot between the upper median branches, and two white spots beyond the cell, the one above these being obsolete. The black border of the hindwing is narrower than in *H. judith*, enclosing a lemon spot between the subcostals, one (obsolescent) above the radial veins, and one, large and diffused, between the upper median branches; an ochreous spot partly enclosed between the lower median and submedian veins; the anal angle slenderly edged with orange-ochreous.

Sumba, interior, rare. I cannot find the type, and the description is not very good. The species, however, which I compared with good series of *H. judith* and *naomi*, is distinct. It is curious that it should more approach the Javanese species than that of the neighbouring islands.

The species figured by Hombron and Jacquinot in the "Voyage au Pole Sud," as "*Pieris judith*, var.," and so placed by Kirby, is certainly distinct. I suggest for it the name of *Huphina imogene*. It is nearest my *H. ethel* from Engano.

HUPHINA VASO, n. sp.

A local form of the Javanese *H. corva*. Male, above, darker than in that species, all the veins heavily outlined with black. Forewing with an almost complete, irregular, outer-discal dark band extending obliquely from the costa to the hind-margin, and continued along the latter to its base; the white submarginal spots beyond this are large. Hindwing with the cell, the upper median, and both the subcostal veins clouded with black, the black border deeply dentate, with a line of diffused black spots submarginally in the middle of the spaces. *Below*, paler than in *corva*, the white markings, especially the submarginal ones, all larger and clearer, the veins all slenderly outlined with ochreous.

Sambawa, coast.

BELENOIS JAVA, Sparr. (*coronea*, Cr.).

Coast of Sumbawa, common, not seen in Sumba. Cramer records this species from Borneo, and in the Singapore Museum there is a specimen labelled Jelebu (not far from Malacca). These localities are certainly doubtful, as the butterfly inhabits dry, sterile coasts, and would be quite out of place in forest countries like Malacca or Borneo. On the other hand a coast-butterfly of exceedingly weak flight, but able to float in the air for an indefinite time, would be more apt to be blown out to sea than other insects, and more likely to survive till its arrival in another island. So that stragglers may really have been taken remote from the true habitat of the species.

This butterfly flies like a *Hestia*, and seems to be the most perfectly protected of Eastern *Pieride*. It is hard to believe that it has anything to do with the Indian *Belenois mesentima*, the type of the genus, which is wholly different in appearance and in habits. Like *Delias* and *Prioneris* this genus has the claws bifid.

## DELIAS PASITHOË, Linn., var.

I saw two specimens of this on Mt. Harnhasa in Sumbawa at nearly 5000 feet elevation, but as well as I can remember neither were taken. An undescribed *Agarista* mimicking it was caught at the same place. No species of *Delias* was observed in Sumba.

## DELIAS ORAIA, n. sp.

A local form of the Indian *Delias descombesii*, and greatly resembling it. It lacks, however, the black marginal band of *descombesii*, the costa and outer margin of both wings being slenderly grey, especially at the ends of the veins, the cilia lemon. Below the five subapical lunules on the forewing are yellow, not white. The female is generally brighter coloured than that of *descombesii*. The hindwing, however, is much darker over the base and disc, but below the submarginal spots are bright lemon, and the hind-margin rich ochreous.

Sumbawa, 2—5000 feet, scarce. The specific name means *beautiful* in modern Greek. I thought it unnecessary to give my detailed description of the species.

The reappearance in Sumbawa of a local form of an Indo-Malayan butterfly unknown to Java, is remarkable.\*

\* I take the opportunity to describe a new Javanese species of this genus.

## DELIAS AURANTIA, n. sp.

Near *D. belisama*, Cr. Above orange over the basal half of the wings, including all the cell, the disc as far as the upper radial vein, far beyond the cell, and the hind



100. *APPIAS*\* *PAULINA*, Cr.

Two forms of this very puzzling group occurred both in Sumba and in Sambawa. One was all white, with only a slender dark marginal line, resembling *A. albina*. The other had the hindwing and the apex of the forewing bright ochreous-yellow below, resembling *A. lankapura*, but without the dark apex. It generally had a black or gray discal spot on the forewing.

I have dubiously recorded *Appias lynciula* from Sambawa, and from Sumba a female which I supposed to be that of *A. (Saletara) nathalia*.

101. *NEPHERONIA VALERIA*, Cr.

Sumba, Sambawa. The submarginal spots are wholly absent. No yellow female was taken. A different species is, I think, also found in Sumba.

margin to the lower angle; the rest black, its inner border serrate. Hindwing with the black border rather wide and equal. *Below*, forewing black with four (five in *belisama*) orange subapical streaks, the lowest obsolescent; a broad oblique orange streak borders the disco-cellular veins, the cell and median veins are outlined with pale orange, the rest of the cell irrorated with black scales, the hind-margin broadly whitish. Hindwing orange like the upperside, the red area darker than in *belisama* and much larger; the inner lunular band more continuous, a marginal yellow line (nearly obsolete in *belisama*), the inner half of the wing, including most of the cell, and on the disc from the hind-margin to beyond the middle median vein, densely irrorated with black scales. Expanse  $3\frac{1}{2}$  inches. From *D. belisama* this may be distinguished by the much smaller black area of the upperside of the forewing, and the large orange areas of the underside of the same wing. The male of *D. belisama* is also usually white, or white tinged with lemon, or yellow with a slight ochreous tinge. From *D. nakula*, recently described from Java by Mr. H. Grose Smith, *D. aurantia* differs in its larger size and rich orange colour.

This fine butterfly is not uncommon on Mount Arjuno, Eastern Java; I did not take it below 2,500 feet elevation, and it is found at any rate up to 5000 feet. *D. belisama* is also common there, ranging from the low country up to about 3000 feet, so that there is a zone where both are found. When flying together *D. belisama* could always be distinguished by its smaller size, East Java specimens being apparently smaller than West Java ones, and under three inches in expanse. On visiting the great volcano of Smérn further east at a different season, I found *belisama* common, but did not see *aurantia* at all.

At 5000 feet on Arjuno, I took a single faded specimen of a *Delias* only  $1\frac{1}{2}$  inch in expanse. It was white, the outer half dark, the forewing with a subapical bar and a row of five subapical spots. The hindwing had the margin broadly black with five yellow (?) spots in it below only. This species does not resemble anything known to me.

\* This is one of Hübner's silly genera, grounded on nothing whatever. I use it most unwillingly as the equivalent of Mr. Wallace's *Tachyris*. Mr. Distinct includes the species of *Huphina* (Mr. Wallace's *Pieris*) under *Appias*, for which I can see no reason. *Catophaga* necessarily falls before *Appias*.

102. *HEBOMIOA GLAUCIPPE*, Linn.

Sumba, Sambawa.

*IXIAS REINWARDII*, Voll.

Sambawa, a beautiful species, confined to the dry coast.

103. *IXIAS* near *PIRENE*, Linn. (*pyrene*).

Sumba, coast, several times seen, but no specimen taken.

*CATOPSILIA PYRANTHE*, Linn. (*evangelina*, Butler).

Sambawa, coast, not observed in Sumba.

104. *CATOPSILIA CATILLA*, Cr.

Sumba, Sambawa.

105. *CATOPSILIA CROCALE*, Cr.

Sumba, Sambawa.

106. *CATOPSILIA SCYLLA*, Boisd.

Sumba, Sambawa.

#### Family PAPILIONIDÆ.

107. *PAPILIO* (*ORPHEIDES*) *ERICHTHONIUS*, Cram. (*erithonius*).

Sumba, Sambawa.

108. *PAPILIO* (*ILIADES*) *MERAPU*, n. sp.

Male, above like *P. memnon*, the pale rays gray, and not very distinct on the forewing. Below the basal crimson areas are larger, the longitudinal streaks in the cell of the forewing obsolescent. Hindwing with the outer pale area partly gray, partly orange-ochreous, narrow, the outer line of spots many times larger than in *memnon*, the inner lying outside of the band, only touched outwardly with ochreous; a separate oblique orange stripe on the abdominal border. The species is the largest of the group, much larger than *memnon*, its expanse being six and a half inches.

Koloki, Pada Dalung, Sumba, 2—3000 feet.

This fine butterfly is called by the Sumbanese after their god Merapu, and I was told that it was after a fashion held sacred, though they raised no objection to my catching specimens. As an instance of the sober tastes of this people, I may remark that they consider this butterfly far handsomer than *Ornithoptera naia*s or *Papilio marembe*.

A form of *Papilio memnon* occurs in Sambawa, but I have no specimens.

109. *PAPILIO* (MENELAIDES) OREON, n. sp.

A local form of *P. liris*, Godart, from Timor and Australia, differing from de Haan's figure of that species in the following particulars. Female, forewing with the dark border narrower than in *liris*, the pale area not tinged with yellow, extending nearly to the base and apparently more marked with black scales. On the hindwing below, the whitish area is less yellow, extends nearer to the base, (occupying two-thirds of the cell), and somewhat further discally, its outer margin scalloped. The white area between the costal and subcostal veins is nearer the base of that space, and is much narrower, being not so long as broad, deeply concave outwardly. There is a submarginal row of seven crimson spots (five in *liris*), that in the interno-median space joining the white area so as to enclose an oval black spot. On the upperside, the hindwing is obscurely marked with red as in *liris*. Expanse four inches and three quarters.

Of the male I have only one very bad specimen, not perceptibly different from the female.

Sumba, confined to the mountain-forests from which I have named it.

*PAPILIO ARISTOLOCHIAE*, Linn.

Sambawa, normal.

110. *PAPILIO* (CHARUS) HELENUS, Linn.

Sumba, Sambawa, confined to the mountains, scarce.

111. *PAPILIO* (HARIMALA) MAREMBA, n. sp.

Male, above black, the markings metallic golden-green, greenish-blue in some lights. Forewing with the base, all the cell and two-thirds of the hind-margin uniformly powdered with green scales; just beyond the cell and forming a crescent round it, is a rather narrow band of rich green from the upper median vein to well above the subcostal, the veins black; beyond this a broad black band, but slightly irrorated with green; after which there is a broad subapical and submarginal area of diffused green, with separate green spots between the median veins; the outer and costal margins dark; the hind-margin rich green near the lower angle as far as the middle of the interno-median space. A large unbroken dark discal patch covered with a cottony mass of odoriferous hairs, extending from the internal to the upper median vein, reaching inwardly almost to the cell, and outwardly along the veins almost to the outer margin. Hindwing with the base powdered with green, a broad green discal area, scarcely entering the cell, extending from the upper subcostal vein to the hind margin; broadest discally;

beyond it are four green lunules; the outer part, including the tails, black. *Below*, the basal half of the wings deep brown, sparsely sprinkled with whitish scales; forewing with a pale transverse band (much more remote from the base than in *P. pericles*), broad subapically, deeply indented outwardly, below the two lower subcostal branches, abruptly narrowed below the lower radial vein. Hindwing with the disc somewhat whitish subabdominally, a row of seven narrow ocelli, outwardly silvery blue, inwardly dull reddish. The ocelli are much further from the outer margin than in the allied species.

This splendid species has no near allies. Apart from the sex-mark, it is nearest *Papilio brama*, Guérin, from Borneo, Sumatra, and the Malay Peninsula.

Sumba, rare near the coast, commoner in the remote interior.

PAPILIO (HARIMALA) PERANTHUS, var.

Sambawa, mountains, scarce. It seems to be intermediate between the Javanese *P. peranthus* and the Timorese *P. pericles*. I have unluckily neither specimens nor description.

112. PAPILIO (ZETIDES) SARPEDON, Linn.

Sumba, Sambawa. In Sumba the red markings of the underside are sometimes replaced by ochreous-yellow.

113. PAPILIO (ZETIDES) EURYPYLUS, Linn.

Interior of Sumba and Sambawa, scarce.

114. PAPILIO (ZETIDES) AGAMEMNON, Linn.

Sumba, Sambawa.

PAPILIO (PATHYSA) ANTIPHATES, Linn.

Sambawa.

115. PAPILIO (LAERTIAS) POLITES, Linn.

Sumba, Sambawa. In Sambawa one female imitates *P. aristolochia*, while another is similar, but with the white discal area replaced by orange. I have unluckily not recorded any female from Sumba.

116. ORNITHOPTERA NAIAS, n. sp.

Male, above black, all the veins except at the extreme base and the internal vein, bordered with paler brown, a longitudinal pale streak generally in the middle of the cell. Hindwing with a small translucent golden patch occupying less than half of the cell longitudinally (its lower and basal part black); four discal spaces from the costal to the upper median vein occupied by quadrate golden areas, which are not incised outwardly as in *O. plata*; that between the costal and subcostal

veins is largest and broadest; a slight diffused golden touch between the upper and middle median veins, more distinct below. *Below* forewing with the pale streaks whitish. Collar and patches at the base of the wings red, abdomen mostly black except around the base of the valves.

Female, above dark brown, the pale streaks conspicuous, whitish, occupying two-thirds of the cell, where they are broad with a conspicuous streak in the middle. Hindwing with a golden area, slightly duller than that of the male, occupying two-thirds of the cell transversely, and six discal spaces from the subcostal to the fold above the submedian vein; a minute spot above the subcostal, the next area small, all of them deeply incised outwardly; four pairs of triangular yellow spots are usually on the outer disc, sometimes connected with the inner golden area, by rays of the same colour; there are a few marginal inter-venular ochreous touches. Collar and base of wings red, abdomen laterally and ventrally yellow with black spots.

The outer margin of the hindwing of the male is remarkably straight; its expanse is nearly five and a half inches.

The golden area of the male differs considerably from that of *O. criton* (Moluccas) and *O. plato* (Timor). In *plato* the red patches are wanting; the female is unknown. In *criton* the female is altogether different. The golden area is probably smaller in *naias* than in any other species of *Ornithoptera*, except the Celebesian *O. haliphron*, in which the cell is all black.

Common in Sumba, both on the coast and in the interior.

In Sambawa occurs a variety (*O. naias*, var. *sambavana*), which is considerably larger. The female has a large golden spot between the costal and subcostal veins of the hindwing; the outer discal pairs of spots are always connected with the central golden area, more or less enclosing large black spots. In the male a golden spot (generally present, though small in the Sumba form) between the upper and middle median veins, is always absent, while in *O. criton*, and presumably in *O. plato*, it is the largest of all.

## FAMILY HESPERIADÆ.

### *Ismene* Group.

#### 117. PARATA MALAYANA, Feld.

Sumba. Another species occurred both in Sumba and Sambawa.

#### 118. HASORA BADRA, Moore.

Sumba, Sambawa. Both this and the Engano form resemble the Javanese, which may and may not be the same as the typical Indian one.

119. *BADAMIA EXCLAMATIONIS*, Fab.  
Sumba, Sambawa.

*Tagiadas* Group.

120. *TAGIAPES BRASIDAS*, n. sp.

Male, above dark brown, forewing with three subapical hyaline spots, the first two approximate, the third well beyond the others, small; two small discal spots, and two terminally in the cell, hyaline. Hindwing, dark brown, the disc irrorated with gray scales, and bearing three dark spots; the abdominal angle widely white enclosing a line of marginal dark spots, the cilia long, white. *Below*, forewing touched with whitish below the lower median vein. Hindwing two-thirds white, with three subapical dark discal spots (the first united with the apical dark area), the second and third unequal, united, the apical border widely dark brown, tapering to below the lower median vein, twice interrupted by white. Female, like the male the hyaline spots in the cell of the forewing united, the discal ones larger, the brown spots bordering the hindwing smaller above and below.

Sumba, and Sambawa, but those from the latter island may not be quite the same. The species is nearest *T. helperii* from the Nicobars, differing in the white border on the hindwing above, and the dark spots on it below. The hyaline marks are also more conspicuous. This also distinguishes it from *T. alica*, which is also much less white below, and has no distinct marginal spots.

121. *ABARATHA SYRICHTHUS*, Feld.

Above, the discal yellowish bands of the hindwing are much narrower and more obscure than in Indian specimens. Below, the forewing is altogether less white; the white mark beyond the cell, which in the Himalayan form extends far outwardly, is reduced to a slender, transverse crescent; the costal streaks above it are obsolete, the submarginal line of quadrate spots much smaller, and the fifth hyaline spot absent.

Sumba, rare.

*ABARATHA HYPERIDES*, n. sp.

Very near *Pterygospidea helias*, Felder, from the Celebes, but the bands and the discal hyaline spots of the forewing are absent, and the apex of the hindwing is broadly dark. From *A. sura* it differs in the forewing, which is almost uniform dark brown above and below. The hindwing is also less variegated above and below, the white area is larger and more uniform, the inner line of spots is obsolete, the outer

united, and dark apically, nearly obliterated by white scales in the median spaces.

Sambawa. Another species, more like *A. angulatus*, was found in Sumba, but no specimens have survived.

*Gehlota* Group.

122. *COLADENIA DAN*, Fab.

Sumba, Sambawa. Two species are confused under this name, and occur together in Sumba, Borneo, the Malay Peninsula, and perhaps elsewhere. They differ obviously in flight and in prehensors, but I cannot at present point out any difference in the markings. One has an egg with numerous ribs (over forty) as in *Gehlota*, the other with few (seventeen) as in *Tagiades*.

*Pamphila* Group.

123. *TILICOTA MÆSOIDES*, Moore.

Sumba, Sambawa. The orange bands are smaller and narrower than in Indian specimens, and the ground-colour dark below.

124. *TILICOTA NIGROLIMBATA*, Snellen.

Sumba, Sambawa. This is the species figured by Mr. Distant; I am not quite sure of its identity with Heer Snellen's species.

125. *TILICOTA GOLA*, Moore.

Sumba, Sambawa.

126. *AMPITTIA MARO*, Fab.

Sumba, Sambawa. I am doubtful of its identity with the Indian form.

*Baoris* Group.

127. *CHAPRA MATHIAS*, Fab.

Sumba, Sambawa.

128. *PARNARA NAROOA*, Moore.

Sumba, Sambawa. I am not sure of its identity with the Ceylon form.

*Suastus* Group.

129. *SUASTUS CHILON*, n. sp.

Above, male all dark brown, no hyaline markings nor patches of lighter-brown scales. Below, forewing with a minute white dot distally in the lower median space, the subapical hyaline spots represented by two slight dark streaks, the lower (in one specimen) containing a

lighter dot. Hindwing nearly white (not gray as in *S. gremius*), the borders dark, a conspicuous black cell-spot, and a row of black discal spots, six in one specimen, four in the other.

The absence of hyaline spots distinguishes it from all others.

Two males, Sumba coast.

### Kerana Group.

#### 130. PLESIONEURA RESTRICTA, Moore.

Sumba, Sambawa, mountains. My Sumbanese *Hesperialæ* have suffered more than any other family, and I have been compelled to omit a number of species, a *Halpe*, two *Parnaras*, a *Parata*, etc.

### EXPLANATION OF PLATE II.

- |   |   |
|---|---|
| Fig. 1. <i>Euplæa eloesii</i> , n. sp. ♀. | 7. <i>Radena kambara</i> , n. sp.         |
| 2. <i>Euplæa lewa</i> , n. sp.            | 8. <i>Nacaduba gaura</i> , n. sp., × 2.   |
| 3. <i>Euplæa palmedo</i> , n. sp.         | 9. <i>Nacaduba laura</i> , n. sp. ♀, × 2. |
| 4. <i>Danaïs litoralis</i> , n. sp.       | 10. <i>Lampides anops</i> , n. sp.        |
| 5. <i>Danaïs orientis</i> , n. sp.        | 11. <i>Lampides masu</i> , n. sp.         |
| 6. <i>Radena oberthurii</i> , n. sp.      | 12. <i>Huphina julia</i> , n. sp.         |

VI.—*Natural History Notes from H. M. Indian Marine Survey Steamer 'Investigator,' Commander R. F. HOSKYN, R. N., commanding. No. 24. List of Deep-sea Holothurians collected during seasons 1887 to 1891, with descriptions of new species.—By DR. J. H. TULL WALSH. Communicated by the SUPERINTENDENT OF THE INDIAN MUSEUM.*

[Received 6th April, 1891;—Read 7th May, 1891.]

Order ELASIPODA, Théel, Chall. Rep. vol. iv, Hol., p. 9.

Family Elpididæ, Théel, l. c., p. 10.

1. PENIAGONE WYVILLII, Théel, Chall. Rep. vol. iv, Hol., p. 42.  
One specimen.

Station 118, 15th December, 1890, Bay of Bengal, lat. 12° 20' N., long. 85° 8' E., 1803 fathoms, globigerina ooze, bot. temp. 35° Fahr. (Alcock).

Family Deimatidæ.

2. ONEIROPHANTA MUTABILIS, Théel, l. c., p. 62.  
One specimen.



April 12th to 13th, 1888, Andaman Sea, N. Sentinel Island bearing N. 15°, W. 18 miles, 250 fathoms (*Wood-Mason*).

3. *DEIMA VALIDUM*, Théel, l. c., p. 68.

"Transparent light orange red" (*Alcock*).

Two specimens.

April 16th, 1888; Bay of Bengal lat. 11° 15' N., long. 91° 16' E., 1840 fathoms, globigerina ooze (*Wood-Mason*).

A fine specimen; length 130 mm.; length of lateral processes 55 mm.

Station 117, Bay of Bengal, lat. 11° 58' N., long. 88° 52' 17" E., 1748 fathoms, globigerina ooze with pieces of pumice, bot. temp. 35.3° (*Alcock*).

4. *DEIMA FASTOSUM*, Théel, l. c., p. 71.

Two specimens.

Station 118 (*Alcock*).

April 20th, 1888, Bay of Bengal, lat. 6° 18' N., long. 90° 40' E., 1520 fathoms (*Wood-Mason*).

5. *ORPHNURGUS ASPER*, Théel, l. c., p. 82, var. *GLABER*, nov.

Length 150 mm. Body smooth and leathery; skin thin and somewhat transparent; colour (in spirit), body greyish white, feet and processes yellowish-white. Tentacles 20, long, extremities brownish and dendritic. Ventral feet 24 on each side, longer and larger near the centre of the body than at the extremities; longest 20-25 mm. Lateral processes generally longer than the pedicles, longest 30 mm. Two rows of processes on each dorsal ambulacrum; these vary considerably in size and short and long ones seem to alternate. Mouth slightly ventral; anus terminal and patulous. Calcareous bodies, spinous rods or smooth rods with branched extremities. Polian vesicle single, 40 mm., wider in the middle than at the extremities.

Colour in the fresh state "salmon-pink" (*Alcock*).

One specimen.

Station 112, 7th November, 1890, Bay of Bengal, lat. 13° 47' 30" N., long. 92° 36' E., 561 fathoms, grey mud, bot. temp. 44.9° (*Alcock*).

6. *PANNYCHIA WOOD-MASONI*, n. sp.

Length 300 mm. Body long, flat and of equal width throughout; skin calcareous but flexible; colour yellowish-white (in spirit). Tentacles 20, round, with stumpy digits; mouth ventral; anus terminal and without teeth. The middle ambulacrum of the trivium bears a double row of feet; outside these the skin is thrown into longitudinal and transverse folds and ridges; the skin on the dorsum is also ridged.

The lateral ambulacra possess a single row of feet much longer than those on the middle ambulacrum. Just above this row of feet there is a row of long, pointed processes; these average 15 mm. in length. The dorsal ambulacra are furnished with a double row of processes; these are shorter than the lateral ones. One polian vesicle; one stone canal; one bundle of genital tubes which are branched and furnished with irregular dilatations. Calcareous ring small; muscles poorly developed relatively to the size of the animal.

The calcareous bodies consist of large, round, many-holed plates, the centre holes being fairly large, the marginal ones small. Besides these plates, a few branched spicules are present.

This species is very closely allied to *P. moseleyi*, Théol.

Numerous specimens.

January 2nd, 1888, off Port Blair, 271 fathoms, bottom green mud (*Giles*).

April 12th, 1888,  $7\frac{1}{2}$  miles E. of N. Cinque Island, Andaman Sea, 490 fathoms, bottom green mud (*Wood-Mason*).

Station 115, December 9th, 1890, Andaman Sea, lat.  $11^{\circ} 31' 40''$  N., long.  $92^{\circ} 46' 40''$  E., off Dyer Point and N. of Cinque island, 188—220 fathoms, green mud, bot. temp.  $56^{\circ}$  (*Alcock*).

#### AMPHIGYMNAS, nov. gen.

Body ovoid with narrow tail-like extremities; soft and appears to have been surrounded by a jelly-like material when fresh. Feet very numerous over the whole of the trivium and placed more or less irregularly. Lateral margins with two or three rows of long processes. Back covered with processes except near the mouth and anus where the body tapers and where the dorsal surface is naked; mouth terminal, small; tentacles 15, very small and retracted; anus terminal, small. Calcareous bodies moderate sized, irregularly rounded, many-holed plates somewhat like those of *Pannychia*. Calcareous ring of 5 small pieces loosely connected.

##### 7. AMPHIGYMNAS MULTIPES, n. sp.

Length 80 mm., width near middle of body 22 mm.; at oral and anal end about 9 mm.

Colour (in spirit) pale purple; the long lateral processes measure about 15 mm., those on the back are shorter.

One specimen.

Station 115, December 9th, 1890, Andaman Sea, lat.  $11^{\circ} 31' 40''$  N., long.  $92^{\circ} 46' 40''$  E., off Dyer Point and N. of Cinque island, 188—220 fathoms, green mud, bot. temp.  $56^{\circ}$  (*Alcock*).

8. *IÆTMOGENE SPONGIOSA*, Théel, l. c., p. 80.*Crydora spongiosa*, Théel, Prelim. Rep. Hol., p. 9.

One specimen.

April 17th, 1888, Bay of Bengal, lat.  $10^{\circ}$  N., long.  $91^{\circ} 7'$  E., 1924 fathoms (*Wood-Mason*).

## Family Psychropotidæ.

9. *EUPHRONIDES DEPRESSA*, Théel, Chall. Rep. vol. iv, Hol., p. 93.

Two specimens.

Station 118, December 15th, 1890, Bay of Bengal, lat.  $12^{\circ} 20'$  N., long.  $85^{\circ} 8'$  E., 1803 fathoms, globigerina ooze with pieces of pumice, bot. temp  $35^{\circ}$  (*Alcock*).

10. *BENTHODYTES PAPILLIFERA*, Théel, l. c., p. 102."Colour purple, tentacles violet black" (*Alcock*).

Two specimens 80 mm. and 68 mm. The fringe is damaged and the dorsal papillæ are not very apparent, but there is, I think, no doubt that these specimens belong to Théel's species.

Station 117 (*Alcock*).11. *BENTHODYTES SANGUINOLENTA*, Théel, l. c., p. 104.

Four specimens; the row of transverse papillæ below the mouth cannot be made out.

Station 118 (*Alcock*).12. *BENTHODYTES OVALIS*, n. sp.

Length 65 mm.; breadth 35 mm. including fringe. Body oval, flat, about twice as long as broad and of a deep purple colour throughout. A double row of feet on the middle ambulacrum of the trivium and no transverse line of feet below the mouth; lateral ambulacra with a single row of feet. On the dorsal surface there are three processes on each ambulacrum; the anterior ones are 15 mm. long and not retractile (?); the posterior one in each row is much smaller. Mouth ventral; anus terminal. Tentacles retracted. Calcareous bodies small 3-armed spicules with the end of each arm clubbed and perforated.

One specimen.

April 12th, 1888,  $7\frac{1}{2}$  miles E. of N. Cinque island, Andaman Sea, 490 fathoms, bottom green mud (*Wood-Mason*).

13. *BENTHODYTES GELATINOSA*, n. sp.

Before describing the specimens as they appear in spirit it will be better to quote the graphic account of the fresh creature given by Dr. Giles, Ad. Rep. Marine Survey of India, 1877-88, p. 15:—

"I must first notice a very peculiar holothurian, several specimens of which were included in the catch..... When fresh, the animal consists of a tough, muscular sac of a yellowish pink colour, enclosed in a thick coating of perfectly transparent, deep violet jelly. Though not sticky or glairy, this jelly is of so delicate a consistence that it was almost impossible to clean the mud from the animal without stripping off the coating. After a short exposure to the action of spirit, this jelly, previously fully 15 mm. thick, shrinks to a thickness of less than 5 mm. and becomes comparatively dense. The violet colouring matter dissolves out into the spirit and exhibits a curious affinity for vegetable tissues, deeply staining a paper label which had been placed within the jar. Its attraction for animal tissues though less marked was still very noticeable, the nuclei shewing it best, so that, on microscopical examination, the animal was found to have become stained in a solution of its own pigment. After hardening in spirit it is sufficiently evident that this jelly-like coating cannot be considered as a secretion, but as an integral part of the tissues of the body wall, as it consists of a plexus of stellate and spindle-shaped cells, enclosing within their meshes many nuclei-form bodies and much hyaline connective substance. The body wall contains but few calcareous bodies. Those present consist of a circular plate, having articulated to it a fan-shaped body so shaped that the whole apparatus is not unlike the badge of a grenadier's cap. As far as could be made out, these bodies appertain to the jelly-like layer and not to the dense inner portion of the body wall, which latter appears to be purely muscular. When laid open it is seen that the lungs are very complex and racemose, and that the ambulacral tubes which are very small and straight, give off a number of minute branches to the pedicels. The polian vesicle is of moderate size and simple. It appears to belong to, or be near, the genus *Benthodytes* of the *Elusipod* family *Psychropotidae*, and is doubtless new as it is identifiable with neither of the species in the Challenger monograph. In all probability, many of its allies must share with this species the peculiarity of a jelly-like coating but no mention of any such appearance is made in the above report."

Length of specimens 100 to 140 mm.—Body soft; extremities and ventral feet are still of a beautiful purple, the body generally is a dark lavender colour (in spirit). The anterior end of the body has a wide lappet-like fringe furnished with papillæ and the border is continued down each side of the flatly cylindrical body and expanded in a less pronounced form as an anal lappet. Along the lateral border there are numerous feet in a single row. Mouth small and ventral; anus large, patulous and somewhat dorsal, situated just above the anal lappet.

Tentacles 15, very small and of a deep purple colour. One, or two, fairly large Polian vesicles; calcareous ring very minute, a double row of sucker feet on the middle ambulacrum of the trivium; these are more numerous and closer together near the anal end while they are entirely absent from the surface, just below the mouth. A single row of fairly long, slender retractile papillæ are seen on each dorsal ambulacrum. Two small bundles of genital tubes. The longitudinal muscles are well-developed, broad, orange-yellow and visible through the skin—only a few calcareous spicules and granules were found in the muscular substance of the body.

Many specimens.

January 2nd, 1888, Andaman Sea off Port Blair, 271 fathoms, (*Giles*), two specimens.

April 12th, 1888, Andaman Sea  $7\frac{1}{2}$  miles E. of N. Cinque island, 490 fathoms, (*Wood-Mason*). Two specimens.

Station 115, December 9th, 1890, Andaman Sea, lat.  $11^{\circ} 31' 40''$  N., long.  $92^{\circ} 46' 40''$  E., off Dyer Point and N. of Cinque island, 188—220 fathoms, green mud, bot. temp.  $56^{\circ}$  (*Alcock*). Eleven specimens.

#### APODOGASTER, nov. gen.

Body long flat and worm-like; slightly wider anteriorly than posteriorly. Down both sides there is a fringe, like that of *Benthodytes*, in which are seen the long tubes of numerous sucker feet. The odd ambulacrum is naked while the lateral ambulacra have one row of small sucker feet situated just below the lateral fringe. A single row of papillæ on each dorsal ambulacrum. Tentacles 15, mouth ventral. Anus terminal.

Calcareous bodies small granules and small wheel-like plates.

#### 14. APODOGASTER ALCOCKI, n. sp.

Length 80 mm.

"Light pink" (*Alcock*).

One specimen.

Station 112, November 7th, 1890, Bay of Bengal, lat.  $13^{\circ} 47' 30''$  N., long.  $92^{\circ} 36'$  E., 561 fathoms, grey mud, bot. temp.  $44.9^{\circ}$  (*Alcock*).

### Order APODA.

#### Sub-order PNEUMONOPHORA.

#### Family Molpadidæ.

#### 15. ANKYRODERMA DANIELSSÉNII, Théel, Chall. Rep. vol. xiv, Hol. p. 39.

One specimen.

April 11th, 1888, 7 miles S. E. by S. of Ross Island, Andaman Sea; 265 fathoms, green mud (*Wood-Mason*).

16. A. MARENZELLERI, Théel, l. c., p. 41.

One specimen.

Station 55, 13th—14th April, 1889, Bay of Bengal, 30 miles W. of Middle Andaman Island (Cape Bluff), 480—500 fathoms, globigerina ooze (*Alcock*).

17. EUPYRGUS SCABER, Lütken, Videnskab. Meddel. Kjöbenhavn 1857, p. 23.

After some indecision as to the correct title of these specimens I have thought it better to name them as above. In general form and appearance they all agree with *Echinosoma hispidum*, Semper, Reis. in Philipp. 1867, p. 44, but differ from *Eupyrgus hispidus*, Barrett, Ann. Mag. Nat. Hist. xx, p. 46, which Semper gives as a synonym of his *Echinosoma*, in having no sucker feet. In the Challenger Report, vol. xiv, Hol. p. 49, *Echinosoma hispidum*, Semp. is given as a synonym of *Eupyrgus scaber*, Lütken, and the *Eupyrgus* of Barrett is not mentioned.

Three specimens.

January 15th, 1888, off Cinque island, Andaman Sea, 650 fathoms (*Giles*.)

Station 107, October 23rd, 1889, Laccadive Sea, lat. 8° 23' N., long. 75° 47' E., 738 fathoms, green mud, bot. temp. 41.9° (*Alcock*).

Station 116, December 9th, 1890, Bay of Bengal lat. 11° 25' 5" N., long. 92° 47' 6" E. off Cinque and Rutland islands, 405 fathoms, green mud, bot. temp. 47° (*Alcock*).

18. TROCHOSTOMA ANDAMANENSE, n. sp.

This species is very closely allied to *T. antarcticum*, Théel, Chall. Rep. vol. xiv, Hol. p. 44.

Length 90 mm.

Body cylindrical and narrowed behind into a tail-like extremity. Skin rough but thin. In spirit the ground colour has become greenish-grey and the spots are more or less blood-red. The tentacles fifteen in number, are yellow and between every two there is, near the base, a blue-black triangular mark. Each tentacle has three very small digits at the free end. Mouth and anus terminal, the latter without teeth, but in one specimen with numerous fine papillæ. One Polian vesicle, one free stone canal; 2 (3?) lungs, not much branched; one bundle of yellow genital tubes. The radii of the calcareous ring are produced backwards as spines. Calcareous bodies not very numerous consisting of a few wide-holed plates and tower like rods which are perforated with 4 to 6

holes. Under the microscope the "chocolate spots" are seen to be composed of rust-red ovoid bodies with a concentric arrangement. They are insoluble in caustic potash.

Colour when fresh "dirty flesh-colour with closely placed deep chocolate spots; the crown (tentacles) being a sort of raw-meat-colour." (*Giles*).

Three specimens.

December 8th, 1887, S. E. of Cinque island, Andaman Sea, 500 fathoms, green mud (*Giles*).

VII.—*On an undescribed Oriental species of Nepeta*.—By D. PRAIN.

[Received 2nd March 1891;—Read 6th May 1891.]

(With Plate III).

In the Calcutta herbarium there is an example of a very distinct species of *Nepeta* which appears to be as yet undescribed. As it has been collected beyond the frontiers of India, it could not with propriety be dealt with in the paper on *Indian Labiatæ* recently read before the Society. But as it possesses rather more interest than isolated new species usually do, its position in the arrangement of Oriental species elaborated by the late M. Boissier in his work (*Flora Orientalis*, iv, 637-670) dealing with the area in which it occurs, as well as a description and figure of the specimen, are now presented.

NEPETA LINN.

SECT. I. EUNEPETA. SERIES I. Perennes. Sub-ser. 2. Nuculæ tuberculatæ.

§ MACROSTEGIÆ Boiss., *Flor. Orient.* iv, 638 (1879) *ampl.*—Verticillastræ densiflora vel laxiuscula remota. Bracteæ ovatæ vel oblongæ. Calyx fauce pilosus vel glaber.

1. Calyx ore obliquus.

a. Calyx fauce pilosus.

*N. Bellevii*.

b. Calyx fauce glaber.

*N. glomerulosa*, *N. juncea*.

2. Calyx ore rectus, fauce glaber.

*N. Scordotis*, *N. Sibthorpii*, *N. leucostegia*.

34 b. NEPETA BELLEVII Prain; robusta, laxè lanata nivea, caulibus elongatis ramosis puberulis obtuse 4-gonis superne subnudis, foliis majusculis sursum decrescentibus oblongo-lanceolatis crenato-dentatis



P. D. J. J. J.

NEPETA SEROTINA, P. R.

A. D. Moll, s.





subrugosis apice acutis basi truncatis, utrinque parce lanatis, inferioribus breve petiolatis cæteris subsessilibus ramealibus ovato-lanceolatis; *verticillastris* multifloris laxiusculis remotis, *bracteis* membranaceis ovato-lanceolatis acuminatis cucullatis calyce æquantibus, *calycis* longo hirsuti membranacei striati ore intus piloso obliquo, dentibus e basi angustiore subulatis summo tubum subæquante cæteris eo brevioribus, *corolla* extus puberula tubo calycis fere 2-plo longiore, staminibus exsertis, *nuculis* oblongis apice obtusis ruguloso-tuberculatis areolâ ferri equini calcaribus sursum directis ad instar affixis.

AFGHANIA AUSTRALI; inter Kandahar et Kelat-i-Ghilzai, *Bellew*!

Rhizoma de-est, caulis p. q. s. plus quam 40 cm. basi fere 1 cm. crassa, foliis inferioribus 7—9 cm. longis his 3—4 cm. latis petiolis 1 cm. longis, ramealibus 2—2·5 cm. longis his 1—1·5 cm. latis sessilibus, *spicâ* 12 cm. longâ hac 2·5 cm. latâ verticillastris (10—12) 12—16-floris imis 2 cm. summis vix 1 cm. remotis, bracteis 12 mm. longis 4—7 mm. latis 3—5-nervis coloratis supra glabris subtus nervis sub lente puberulis margine prope basin parce pilis albis divergentibus ornato prope apicem acuminatum et tandem subulatum sub lente puberulo, *calyce* tandem subinflato pedicello 1—2 mm. longo tubo 6 mm. longo dentibus summo 6 mm., lateralibus 5 mm., imis 4·5 mm. longis extus æquabiliter pilis albis divergentibus parce hirsuto intus tubi ore et dentium basibus pilis simillimis densissime piloso, *corolla* tubo 11 mm. longo extus puberulo colore forsan rosea, *nuculis* 3 mm. longis his 1·5 mm. latis brunneis areolâ albâ calcaribus 1 mm. longis exceptâ manifeste rugulosis.

This very distinct species bears a considerable resemblance to the European *N. tuberosa* but the whorls are much more lax, the calyx mouth is oblique and no secondary reticulation of the membranous bracts is visible. The nutlets of this species also closely resemble those of *N. tuberosa* and *N. Sibthorpii*, but in these European species there is a much smaller areola of the usual type. Among Oriental species it most resembles *N. glomerulosa*, next to which it is now placed, but it differs greatly in having much larger bracts, much longer spikes and many-flowered lax whorls with longer corollas. The nutlets too are different—the horse-shoe shaped areola of the nutlets being perhaps the most remarkable character of this species; its pilose calyx-mouth also is a character which connects it with § *PSILONEPETÆ Benth.* to which group this feature has hitherto been supposed to be confined. Except for this character, however, it is much more obviously related to the other *MACROSTEGIÆ* than to any *PSILONEPETA*. Perhaps a preferable view would be to look on this species as the type of a new subsection intermediate between *Psilonepetæ* and *Macrostegiæ* though to be

placed in the same subseries as the latter. This subsection would be characterised as follows:—

§ *PSILOSTEGIÆ* (*Sub-sect. nov.*).—*Verticillastra laxiuscula remota*. Bractæ ovatæ. Calyx fauce pilosus. (Nuculæ tuberculatae).—Inter *PSILONEPETAS Benth.* et *MACROSTEGIAS Boiss.* quasi mediantes et proximæ *MACROSTEGIIS (Boiss., Flor. Orient. iv, 638 et 651)* antepouondæ.

#### EXPLANATION OF PLATE III.

##### *NEPETA BELLEVII*, Prain.

- |   |                             |
|---|-----------------------------|
| Fig. 1. Bract.  | Fig. 4. Corolla tubo.       |
| 2. Calyx.   | 5. Upper lip of Corolla.    |
| 3. The same, laid open.   | 6. Nutlet, external aspect. |
| 7. The same, showing inner face with characteristic horse-shoe shaped areola. |                             |

#### VIII.—*Noviciæ Indicæ.* IV. *Two additional species of GLYPTOPETALUM.*— By D. PRAIN.

[Received 20th April, 1891;—Read 6th May, 1891.]

In a collection of plants from Great Coco, an island thirty miles north of N. Andaman, are complete examples of a species of *Glyptopetalum* nearly related to *G. zeylanicum*, Thw. This plant was previously collected, but only in fruit, either in Tenasserim or the Andamans by Helfer\* and an example of the gathering (Helfer n. 1973) was described by Kurz in this *Journal* (vol. xli, [1872], pt. 2, p. 299) as *Euonymus calocarpus*, Kurz. The same plant (specimens also incomplete) has been reported from Kondil (Nicobars) by Calcutta garden collectors, and this gathering, along with a plant from Great Nicobar (Novara 188, Jelinek 245; not represented at Calcutta), has been

\* This gentleman, as members are aware, was assassinated in North Andaman; his collections were disposed of in Europe and distributed thence; the circumstances of his decease rendered it impossible to differentiate positively his Tenasserim from his Andamans specimens. Kurz believed this gathering (n. 1973) to be from Tenasserim, and Lawson (*F. B. I.* i, 612) gives the same locality; I am not aware, however, what authority these authors had for this definite decision, the *Herb. Calcutta* specimen on which Kurz based his description yields none.

referred by Kurz in this *Journal* (vol. xlv, [1876], pt. 2, p. 123) to *Euonymus javanicus* Blume.\*

As it is necessary to formally remove the plant from the genus to which it has hitherto been referred† the opportunity has been taken of providing a full description; at the same time a description is given of a second species collected—in fruit—in the Mishmi Mts. by Griffith; a synopsis of all the species now known precedes these descriptions.

In the four species of which the fruit is known, the dorsal raphe does not terminate at the organic base of the seed but there divides into 3-4 lacinate segments of the same appearance and consistence as the raphe itself; from the raphe they only differ in being slightly branched and in not quite reaching the hilum. They form a closely adherent

\* No opinion can be expressed here regarding the Novara expedition specimens; no example of *E. javanicus* has hitherto been obtained in the Nicobars by Calcutta collectors.

† It is true that Kurz did not think *Glyptopetalum* Thw. generically separable from *Euonymus* Linn. for in this *Journal* (vol. xlv, [1875], pt. 2, p. 259) he formally relegates it to *Euonymus* (as a section) and in the *Forest Flora of British Burma* (vol. i, [1877], p. 249) he does not accord *Glyptopetalum* even sectional rank. It must also be pointed out that Bentham and Hooker had already (*Gen. Pl.* i, [1862], p. 361) pointed out how slight are the characters—the principal one being the solitary pendulous ovules—that separate *Glyptopetalum* from *Euonymus*; Baillon also (*Hist. des Plantes*, vi, [1875], p. 1, footnote) takes the same view as Kurz. If therefore the views of Kurz and Baillon ultimately prevail this plant will again be known as *Euonymus calocarpus* Kurz.

But while this is the case it will be seen on referring to the place of its publication that Kurz did not recognise in this species an example of his own section *Glyptopetalum*. In the *Flora of British Burma* too the generic description of *Euonymus* given by Kurz implies that the cells of the ovary are at least 2-ovuled—an implication opposed to his own statement (*J. A. S. B.* xlv, pt. 2, 159) as regards *Glyptopetalum sclerocarpum* and, as regards the species under review, incorrect. Kurz's views regarding the generic position of *Glyptopetalum* may therefore, I think, be ignored, and Baillon's authority can hardly be quoted in Kurz's support since that author takes so comprehensive a view of *Euonymus* that he is prepared to merge in it not merely *Glyptopetalum* Thw. but also *Lophopetalum* Wight, a step which Kurz has nowhere proposed. Moreover the genus *Glyptopetalum*, as founded by Thwaites (*Hook., Jour. Bot.* viii, [1856], p. 267), is sustained by Bentham and Hooker (*Gen. Pl.* i, [1862], p. 361), by Hooker and Thwaites (*Enum. Pl. Zeylan.* [1864], p. 73), by Beddome (*Flor. Sylvat.* i, [1874], t. 102), by Lawson (*Flor. Brit. Ind.* i, [1875], p. 612), by Trimen (*Cat. Ceylon Pl.* [1885], p. 18) and by Durand (*Index Gen. Phaner.* [1888], p. 66); considering too the large number of species of *Euonymus* proper already described and the ease with which species of *Glyptopetalum* are distinguished from these, it appears inadvisable at present to follow Kurz and Baillon in suppressing the latter genus. The present retention of *Glyptopetalum* moreover disturbs the synonymy of only one species instead of changing that of several.

*arillar* structure with meridional segments differing in colour from the testa that it overlies. The presence of this arillus proves that the coloured "aril" (which in turn loosely overlies it) is not a *true arillus* but, as Planchon has pointed out as regards the aril of *Euonymus*, an *arillode*.

### GLYPTOPETALUM THWAITES.

Characters of *Euonymus* but ovules solitary and pendulous from the apex of the cell.

*Cymes shorter than leaves, flowers under 20 mm. diam. :—*

*Fruit quite smooth :—*

*Peduncles*  $\frac{1}{2}$  *as long as leaves, cymes lax*

*2-3 times divided; leaves thinly cori-*

*aceous oblong-lanceolate serrate, pe-*

*tals oblong, flowers 12 mm. diam.,*

*arillode covering  $\frac{3}{4}$  of seed and lobed*

*at the margin*

...

1. *G. zeylunicum.*

*Peduncles very short, cymes dense 1-2*

*times divided :—*

*Cymes longer than petioles, peduncles*

*longer than pedicels; leaves coriaceous*

*ovate-oblong entire, nerves indistinct,*

*petals oblong, flowers 8 mm.*

*diam., arillode covering  $\frac{2}{3}$  of seed*

*and lobed at the margin*

2. *G. calocarpum.*

*Cymes not exceeding petioles, peduncles*

*shorter than pedicels, leaves membranous,*

*ovate-oblong serrate, nerves*

*prominent beneath, arillode hardly*

*covering  $\frac{1}{3}$  of seed, margin entire...*

3. *G. Griffithii.*

*Fruit rough tubercular; peduncles  $\frac{1}{2}$  as long*

*as leaves, cymes lax 2-3 times divided,*

*leaves thickly coriaceous, oblong-lance-*

*olate serrate, petals suborbicular, flowers*

*8 mm. diam., arillode covering  $\frac{1}{2}$  of seed,*

*margin sinuate...*

...

4. *G. sclerocarpum.*

*Cymes longer than leaves, flowers over 20 mm.*

*diam.; cymes lax once divided, leaves*

*thinly coriaceous, oblong-elliptic entire,*

*petals obovate, flowers 30 mm. diam.;*

*fruit unknown*

...

5. *G. grandiflorum.*

1. GLYPTOPETALUM ZEYLANICUM *Thwaites*. (*F. B. I.* i, 612).

INDIA AUSTRALIS; ZEYLANIA.

2. GLYPTOPETALUM CALOCARPUM.—(*Euonymus calocarpus* *Kurz*, *Jour. As. Soc. Beng.* xli, ii, 299 (1872) et xlii, ii, 159 (1875); *Laws*, in *Hook. f., Flor. Brit. Ind.* i, 609 (1875); *Kurz*, *For. Flor. Brit. Burma* i, 249 (1877).—*E. javanicus* *Kurz*, *Jour. As. Soc. Beng.* xlv, ii, 123 [*Veg. Nicobar.* 19] (1876), *saltem in parte, haudquaquam* *E. javanicus* *Blume*.)

TENASSERIM?; *Helfer* (n. 1973). N. ANDAMANS; Great Coco, Little Coco, Table island, *Prain*. NICOBARS; *Kondil*, *Calcutta garden collectors*.

*Arbuscula* glabra ramulis glabris teretibus, *foliis* coriaceis supra viridibus subtus prasinis elliptico-oblongis utrinque cuneatis apice obtusis margine integris nervis 5—6-paribus indistinctis, petiolis brevibus; *cymis* axillaribus vel parum extra-arillaribus paucifloris densioribus pedunculis semel rarius iterumque divisis; pedicellis brevibus; floribus parvis albo-viridescentibus, *calyce* 4-lobo lobis omnibus rotundatis exterioribus interioribus 2-plo minoribus, *corollæ* petalis 4 oblongis obtusis planis prope basin 2-foveolatis; *staminibus* 4 filamentis erectis in disci angulis obtusis insertis, loculis antherarum basi divergentibus; *ovario* pyramidato-tetragono disco affixo stigmate minuto, 4-loculare; *ovulis* in loculis singulis pendulis anatropis, raphi extrorsa; *capsula* 1—4-sperma rotundata loculicidim deliscente, *seminibus* oblongis pendulis, arillo laciniato in testa membranacea adhaerente e raphi orto ornatiss et arillodio carnoso rubro obtectis; *embryone* intra albumen carnosum orthotropo, cotyledonibus oblongis foliaceis, radícula brevi.

*Arbuscula* 4—12 metr. alta, *foliis* oppositis 9—16 cm. longis his 6—9 cm. latis, petiolis .75 cm., *cymis* 3—9-floris pedunculis 20—30 mm. longis, pedicellis 4 mm. longis, *sepalis* exterioribus 1.5 mm. interioribus 3 mm. diam., *petalis* 3 mm. longis latisque, *capsulis* extus viridibus intus pallidis 1 cm. longis his 1—2 cm. latis *seminibus* 8 mm. longis his 7 mm. latis testa aurantiaca, arillo pallido, arillodio rubro 6 mm. alto.

Differs from *G. zeylanicum* by its rounded branches, thicker broader leaves with margins entire, by its much smaller flowers with petals flat and not reflexed at the margin, and by its rather shallower arillode. The true arillus is identical in both and the margin of the arillode is similarly lobed.

## 3. GLYPTOPETALUM GRIFFITHII.

In montibus MISHMI; *Griffith* (n. 1996).

*Arbuscula* ? glabra ramulis glabris sub-4-gonis, *foliis* membranaceis læte-virentibus, elliptico-oblongis apice acuminatis basi cuneatis margine parce et minute dentatis, nervis 6—7-paribus subtus prominentibus,

petiolis distinctis; *cymis* axillaribus paucifloris densis pedunculis semel divisus, pedicellis elongatis; *floribus* .....; *capsula* 1—4-sperma rotundata loculicidim dehiscente; *seminibus* oblongis pendulis basi tantum arillodio carnoso obtectis; *embryone* intra albumen carnosum orthotropo, cotyledonibus oblongis foliaceis, radícula brevi.

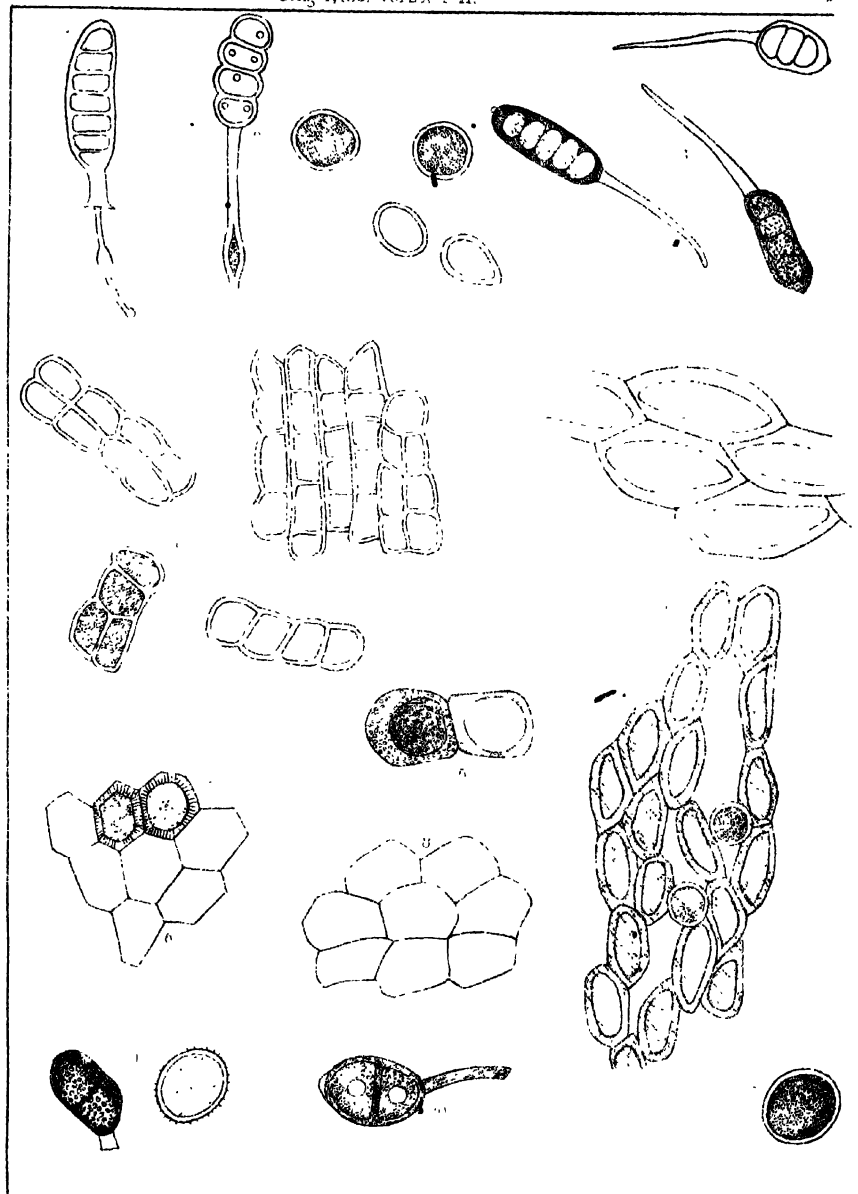
Arbuscula? *foliis* oppositis 10—15 cm. longis his 6—9 cm. latis, petiolis 1 cm. longis, *cymis* 3-floris pedunculis 2—4 mm. longis pedicellis 8—9 mm. longis, *sepalis* omnibus 2·5 mm. diam., capsulis extus læte-viridibus intus pallidis 1 cm. longis his 1—2 cm. latis seminibus 8 mm. longis his 7 mm. latis, arillodio 2·5 mm. alto.

This species is well distinguished by its very short cymes with peduncles shorter than the pedicels and by its much shallower arillode. The sepals are all of equal size, the capsules externally are not distinguishable from those of *G. zeylanicum*.

4. GLYPTOPETALUM SCLEROCARPUM Kurz. (F. B. I. i, 613).  
PEGU.

5. GLYPTOPETALUM GRANDIFLORUM Beddome. (F. B. I. i, 613).  
INDIA AUSTRALIS.



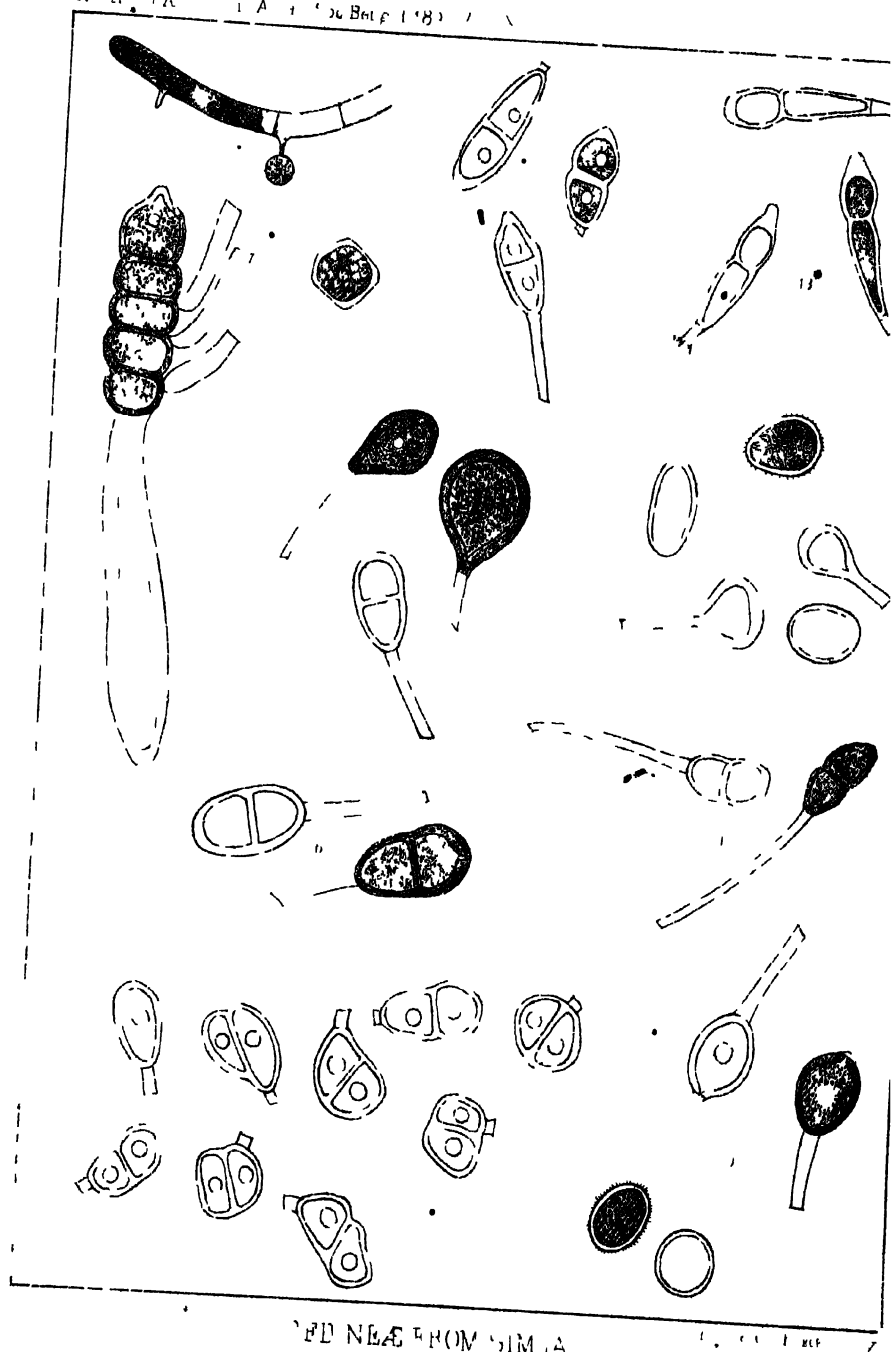


TRIDINAE FROM SIMLA

11. 9. 3. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21.









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IX.—*Additional Uredineae from the Neighbourhood of Simla.*  
*By A. BARCLAY, M. B., Bengal Medical Service.*

[Received 12th June, 1891; Read 1st July, 1891.]

(With Plates IV and V)

Since the completion of my Descriptive List of the Simla *Uredineae*, published in former volumes of the Journal of this Society I have found, or have been supplied with, 32 other species, which are described in the following pages. Of these 32 species, 4 are *Uromyces* (2 new), 11 *Puccinia* (5 new), 3 *Phragmidia* (all new), 1 *Xenodochus* (new), 2 *Melampsora* (1 new), 5 isolated Aecidial Forms (3 probably new), and 6 isolated Uredo Forms (5 probably new). Of the 32 species described, therefore, probably 20 are new.

HEMIUROMYCES.

UROMYCES VIGNAE, n. s.

\*On *Vigna vexillata*, Benth.

I found this plant (on Tara Devi) towards the end of August immensely attacked by a species of *Uromyces*. The leaves were sometimes almost blackened\* with pustules. These were irregularly scattered over the leaf blade on both surfaces, but more freely over the lower

surface; and it appeared to me probable that they first emerged from this surface, and later from the upper surface, at a more advanced stage. Each pustule was round and convex, and without any pulling of tissue around. On a few of the younger leaves I found some paler brown uredo pustules, on both surfaces of the leaf. Except in colour they were similar to the teleutospore pustules.

The *uredospores* are brownish red, oval to round, thin walled, very spiny, and with a few immature teleutospores among them (Pl. V, fig. 19). They measured when fresh and just wetted  $26-19 \times 19-18\mu$ .

The *teleutospores* are deep brown, oval, very deciduous, with a portion of colourless stalk adherent, with a pale brown shallow mammilla at the free end, a clear nuclear vesicle, a germ pore just under the mammilla, and a smooth surface (Pl. V, fig. 19). The fresh spores just wetted measured  $35-27 \times 22-20\mu$ . The portion of adherent stalk measured up to  $40\mu$  in length. These spores refused to germinate, probably requiring a period of rest. But some uredospores germinated throwing out simple long unbranched tubes.

As this host is nearly related to *Lathyrus sativus*, I at first thought the fungus must be the same as that I have described elsewhere\* on that plant, namely, *Uromyces Pisi*, Pers.; but the uredospores of the fungus on Vigna are considerably smaller, whilst the teleutospores are larger. It is therefore probable that the species I have here described is different, and I have named it *Uromyces Vignae*.

#### UROMYCES AGROPYRI, n. s.

On *Agropyrum*, sp.

This grass was collected also by Mr. Lace at Ralli (Bashahr), 7,000 feet, in October.

On some leaves there were light brown pustules on both leaf surfaces, and these contained uredospores. Other pustules were long, linear and black on the under leaf surface, somewhat resembling pustules of *P. graminis*.

The *uredospores* are round to oval, pale brown, densely warted, with several germ pores (4 to 5), and measured when just wetted  $23-20 \times 21-19\mu$ .

The *teleutospores* are lightly adherent to their beds, coming off with a small piece of stalk attached. They are light yellowish brown, much thickened at the apex, smooth on the surface, with a clear nuclear vesicle, measuring when just wetted  $37-28 \times 18-16\mu$ .

Hitherto, so far as I am aware, this genus of grasses was known to

\* Journal of Botany, Sept. 1890.

harbour only two species of *Puccinia* (*P. graminis* and *P. coronata*). This is therefore probably a new species.

*UROMYCES PULVINATUS*, Kalchb. et Cooke.?

On *Euphorbia hypericifolia*, Linn. var. *indica*.

Mr. Lace collected a *Puccinia* on this species of *Euphorbia* in October in a low valley of Bashahr, about 6,000 feet above the sea level. The under-surfaces of the leaves were profusely covered with dark brown circular pustules, usually distinct from one another, but sometimes coalescing. The spores are readily scraped off. These consist of:—*uredospores* which are yellow, thin-walled, spiny, and  $20 \times 19\mu$ ; and *teleutospores*. These are small, brown, thick-walled, single-celled, with a small piece of stalk adhering (sometimes none), warted on the surface, and generally with a clear nuclear vesicle. When just wetted they measure  $21-17 \times 18-16\mu$ .

Of the several species of *Uromyces* which inhabit species of *Euphorbia* the one I have just described comes nearest *U. pulvinatus*, Kalchb. et Cooke, and *U. Myristica*, B. et B. The former has been described from South Africa, and the latter from North America. In size of spore the Himalayan fungus resembles the former more than the latter; but the spores of *U. pulvinatus* are smooth, whilst those of *U. Myristica* are punctated like mine.

MICRUROMYCES or LEPTUROMYCES. \*

*UROMYCES AMBIENS*, Cooke.

✱

On *Buzus sempervirens*, Linn.

Specimens of this fungus were gathered by Mr. Lace in the Bhahar Valley, Bashahr (6,000 feet) in October. The leaves were studded with circular patches 1—4 mm. in diameter. Some of these were orange yellow, and others pale in the centre, but surrounded by a black circle. The centres of all patches contained very prominent papillae (spermogonia?). All the pustules were hypophyllous. In the case of patches which were not black the central papillae were surrounded by a circular mound covered with epidermis. This mound was a circular covered spore pustule. The spores were orange red, but as they were thick walled and otherwise like immature teleutospores I do not regard them as uredospores. The black circles surrounding the other patches were naked teleutospore beds. The spores from such parts are large, yellowish brown, round to oval, fairly firmly adherent, coming off usually with a short stalk or none, thick walled, showing a distinct pore at the

summit which is not thickened. Their surfaces were smooth, and they measured when just wetted  $44-40 \times 36-34\mu$ .

This is doubtless *Uromyces ambiens*, but I have no access to the measurements of the spores. Cooke's specimens apparently came from the Himalayas.

#### HEMIPUCCINIA.

#### PUCCINIA SORGHI, Schw.

On *Zea Mays*, Linn.

I had long searched in fields of maize for a Uredine, but without success until 1890 when I found it in some fields at Mashobra. Up to this time I was acquainted with the fungus only on *Sorghum vulgare*, on specimens of the plant sent to me for examination from the Poona district. But this is absolutely the first record of its existence on maize in India, so far as I am aware. My specimens were gathered early in October. Pustules were found abundantly on both leaf surfaces, some covered entirely with a scale of epidermis, whilst others were more or less naked. The covered pustules contained uredospores, the naked ones mostly teleutospores, and the perfectly matured open ones, which are inky black, only teleutospores. Some pustules were minute and circular, others long and even linear.

The uredospores are pale brownish red, round to oval, beset with shallow warts or short spines, and measure when just wetted  $30-26 \times 26-20\mu$ . By applying sulphuric acid I detected 3 germ pores in each spore, arranged around the short equator.

The teleutospores are firmly attached, breaking off with a portion of stalk adhering. They are reddish brown, rounded at both ends, thickened at the free end, constricted at the septum, and apparently smooth on the surface. When just wetted they measured  $42-32 \times 18-16\mu$ . They refused to germinate immediately after ripening. There were no paraphyses.

This fungus is much more like *Pucc. Sorghi* than that which grows on *Sorghum vulgare*, and which I have described elsewhere.\* In the first place the fungus on *Zea* has no paraphyses, and in the second the measurements of both uredo- and teleutospores approximate those given for *Pucc. Sorghi* much more closely. In the publication above alluded to I referred the parasite on *Sorghum* with hesitation to *P. Sorghi*. I am now inclined to think that the latter is a different species. Lastly, even later I found a *Puccinia* on '*Pennisetum typhoides*, Rich. (Bajra)

\* Journal of Botany, Sept. 1890.

at Erode in the Madras Presidency, which is undoubtedly the same as that on *Sorghum*. As neither of these fungi (on *Sorghum* and *Pennisetum*) are Himalayan I shall not describe them in detail here; but in order to enforce my argument that the fungus on *Zea* is *P. Sorghi*, whilst that on *Sorghum* and *Pennisetum* is a different species, which I shall call *Puccinia Penniseti*, I subjoin in tabular form their salient characters.

| Host.              | Uredospores.  | Telentospores. | Paraphyses. | Apical thickening. | Germ pores in uredospores. |
|--------------------|---------------|----------------|-------------|--------------------|----------------------------|
| <i>Pennisetum</i>  | 34-30 × 24-22 | 18-44 × 29-26  | present.    | none.              | 2                          |
| <i>Sorghum</i> ... | 34-30 × 22-20 | 50-41 × 29-22  | present.    | none.              | 4-5                        |
| <i>Zea</i> ...     | 30-26 × 26-20 | 42-32 × 18-16  | none.       | present.           | 3                          |

### PUCCINIA ELLISII, De-Toni ?

On *Angelica glauca*, Edgw.

This plant was found by Dr. G. Watt at Fagoo in August, bearing uredo- and telentospore pustules, both minute, discrete, and hypophyllous; but whilst the former are pale yellow, the latter are dark brown to black. Both kinds of pustule occurred together on the same leaf.

The *uredospores* are round to oval, very pale yellow, very spiny, and when just wetted 30-24 × 25-20 $\mu$ . (Pl. IV, fig. 9).

The *telentospores* are deep brown, rounded at both ends, slightly constricted at the septum, coming off with little or no stalk adhering, not thickened as a rule at the free end, and tuberculated over both cells (Pl. IV, fig. 9). They are sometimes irregular in shape. They measured when just wetted 38-22 × 22 $\mu$ .

This is possibly *Pucc. Ellisii*, though both the uredo- and telentospores of this last mentioned species are larger, the former measuring 35-30 × 30-24, and the latter 40-35 × 25-20 $\mu$ . It is certainly not *Pucc. Angelicae*, Schum. which shows a tendency to erupt along the nerves, among other differing characters.

### PUCCINIA CASTAGNEI, Thüm ?

On *Apium graveolens*, Linn.

I have hitherto confused a fungus on this host with *Pucc. Pimpinellae*, Strauss; but it is certainly distinct.

The *uredospores* are very pale brown, covered sparsely with spines, and with three germ pores, each covered with a hyaline semilunar



thickening, like that described in *Pucc. Prenanthis*. Through each of these a commencing germ tube protrudes, but one only develops fully. They are in pustules mostly hypophyllous, but some few epiphyllous. These uredospores afford another instance of extremely long retained power to germinate. I put some spores scraped off from leaves gathered on the 31st October into water on the 13th June, and found on the following day that many had germinated most freely, although the accompanying teleutospores remained ungerminated.

The *teleutospores* are brownish yellow, very irregular in shape, the septum often oblique, and even perpendicular, slightly constricted at the septum, generally not thickened at the free end, though sometimes slightly so, mostly rounded at both ends, but sometimes with the lower cell narrowing towards the stalk (Pl. V, fig. 18). After lying 24 hours in water these spores measured  $41 - 26 \times 24 - 18\mu$ .

This is possibly *Pucc. Castagnei*, whose teleutospores are said to be very irregular and to measure  $46 - 36 \times 24 - 18\mu$ .

#### PUCCINIA EULALIAE, n. s.

On *Pollinia japonica*, Haeck.

The leaves of this grass presented dark reddish brown linear pustules, mostly on their under-surfaces. These pustules contained uredo- and teleutospores with numerous capitate paraphyses.

The *uredospores* are oval or pyriform, pale brown, and spiny, and measure when just wetted  $30 - 28 \times 21 - 20\mu$ .

The *teleutospores* are reddish brown: the upper cell is rounded and not thickened specially anywhere; the lower is broadly wedge-shaped. The surface of the spores is smooth, and they usually have a short piece of stalk adhering. They measure when just wetted  $38 - 34 \times 20 - 18\mu$ . The paraphyses are numerous, reddish brown, capitate, the heads measuring about  $16\mu$  in diameter.

This is probably a new species.

#### MICROPUCCINIA.

PUCCINIA EXCELSA, n. s.

On *Phlomis lamiifolia*, Royle.

I found this plant early in September on the summit of the Hnttoo peak bearing *Puccinia* pustules. I next found it, about the same time at Mahasu, a hill close to Simla. The leaves were densely bespattered on the under surfaces with fairly large, round to oval, dark brown, almost black, circular hemispherical pustules, with a smaller less fre-

quent epiphyllous eruption opposite the beds below. The upper surface of attacked leaves is rendered conspicuous by the yellow zones surrounding the pustules. Pustules were also found on the petiole and smaller stems, though not so frequently.

The spores are fairly easily detached, coming off as a rule with no portion of stalk adhering. They are dark brown, somewhat irregular in size and shape, mostly distinctly constricted at the septum, and mostly narrowing towards the free end, where there is a slight pale mammilla or conical thickening (Pl. V, fig. 12). At the base the spore is sometimes rounded, and sometimes narrowed. It is smooth on the surface. The fresh spores examined at once in water measure  $40 - 28 \times 18 - 14\mu$ .

No uredospores are apparently formed by this species, since I got specimens of teleutospores from the earliest stages of development. The teleutospores would not germinate immediately after ripening.

There is no doubt, I think, that this fungus is distinct from *P. Phomidis*, Thüm.

#### LEPTOPUCCINIA.

##### PUCCINIA USTALIS, Berk. ?

On *Ranunculus hirtellus*, Royle.

I found seedlings of this plant bearing teleutospore pustules on the Mattiana hill on the 4th September. The pustules were quite young, and there was no trace of uredospore. The teleutospore pustules were small, dark, circular, and hypophyllous, with spots of paling on the upper leaf surface. These pustules were confined to the youngest leaves, and were never found on the upper ones. The pustules had a distinct though not pronounced circinate arrangement. The spores are very firmly adherent; they are long, more or less spindle-shaped, pale yellowish brown, much thickened and conical at the free end, well constricted at the septum, and narrowing towards the stalk. The surface is smooth (Pl. V, fig. 13). In scrapings I noticed many empty spore cases, and I presume therefore that the species is a *Leptopuccinia*. When just wetted the spores measured  $61 - 46 \times 23 - 8\mu$ , the apical thickening being  $10 - 4\mu$  in depth. I placed some spores in water on the 10th September, and on the following day found some had germinated. The sporidia are oval or somewhat semilunar, colourless, and  $13 \times 6\mu$ , in measurement. The sterigmata are four in number, short, conical, and pointed, and together with the whole premycelium colourless.

This is possibly *P. ustalis*, Berk.; but I have no access to the spore measurements.

## MICRO or LEPTOPUCCINIA.

## PUCCINIA DOLORIS, Speg. ?

On *Erigeron alpinus*, var. *multicaulis*, Wall.

This plant, harbouring a species of *Puccinia*, was gathered by Mr. Lace on the 27th August near the banks of the Sutlej in Bashahr, at an elevation of about 7,000 feet. The under surfaces of the leaves bore numerous large black pustules, irregularly scattered as a rule, but sometimes with several smaller pustules in a circlet around a larger central one. Most pustules were naked, but some were covered over with a scale of epidermis. Though most pustules are hypophyllous some few are on the upper leaf surface.

The spores are readily detached, coming off with only a very small fragment of stalk adhering. They are yellowish brown, rounded at both ends, well constricted at the septum, thickened and broadly conical at the free end, beset externally over both cells with shallow short ridges and tubercles, and measuring when just wetted  $42-34 \times 18-16\mu$ . The thickening at the free end is usually  $6\mu$  in depth. I placed them in water in October, but they did not germinate.

This fungus resembles *Pucc. doloris* as described by De-Toni\* in many respects, and I have accordingly named it so. But as *P. doloris* is known only, so far as I am aware, from the Argentine Republic, it is quite possible that the Himalayan species is distinct.

## PUCCINIA SAXIFRAGAE-MICRANTHAE, n. s.

On *Saxifraga micrantha*, Edgw.

Mr. Lace collected this plant, bearing a *Puccinia*, in Bashahr at an elevation of 9,500 feet. On the under leaf surfaces were a number of minute, circular, discrete, brown pustules, sometimes very numerous.

The teleutospores are readily detached, and many were found to be empty. The species is probably therefore a *Leptopuccinia*†. They are pale brown, not thickened anywhere, with a slight apical mammilla, usually slightly constricted at the septum, but sometimes considerably so, and somewhat irregular in size and shape. When just wetted they measure  $35-26 \times 14-12\mu$ . I placed these spores in water, but none germinated. There were no uredospores in the specimens sent to me.

This species is quite distinct from *Pucc. Saxifragae-ciliatae* mihi. It is also evidently distinct from *P. Saxifragae*, Schlecht.

\* Saccardo, Sylloge Fungorum.

## PUCCINIA CAUDATA, n. s.

On *Stellaria paniculata*, Edgw.

Dr. G. Watt collected this plant in Narkanda, bearing a *Puccinia*. The teliospore beds are dark brown, well raised with a circinate tendency, and hypophyllous, with pale patches on the upper leaf surface. The spores are very adherent, more or less spindle-shaped, pale brown, well constricted at the septum, usually much thickened at the apex, with a long piece of adherent stalk (often twice, or a little more, than the whole length of the spore) and measuring  $37 - 28 \times 16 - 13\mu$ . (Pl. V, fig. 17.).

This is evidently not *P. Arenariae*, Schum. and I have regarded it as a new species.

## PUCCINIA CRASSA, n. s.

On *Pimpinella Griffithiana*, Boiss.

This was gathered by Mr. Lacey in Ziarat in Afghanistan at 8,000 feet. The teliospore pustules are dark brown and hypophyllous. The spores are brown, almost rounded at both ends, but diminishing somewhat towards the stalk, of which a small fragment remains adherent. They are slightly constricted at the septum, and slightly thickened at the apex (Pl. V, fig. 16). When just moistened the spores measure  $50 - 41 \times 24 - 22\mu$ . The epispore has shallow tubercles over both cells. They would not germinate.

This fungus is quite distinct from *P. Pimpinellae*, Strauss which is one of the most common of the *Uredineae* in Simla. Neither are the spores like any of the other species inhabiting *Pimpinella* described by De-Toni\* (except perhaps *P. Pimpinella*, St var. *Eryngii*, D. C.) It is I think a new species.

## PUCCINIA PULVINATA Rabenh. ?

On *Echinops niveus*, Wall.

A *Puccinia* on this host was gathered for me by Dr. G. Watt in Simla. The leaves had numerous minute well raised black pustules all epiphyllous. The spores are readily detached from their beds. The plant was in full flower inclining to seed. The spores come off sometimes with a long piece of stalk attached, sometimes with a short. The spore surface is studded with shallow tubercles. They are brown, slightly constricted at the septum, mostly rounded at both ends, the free end slightly thickened. Most spores were found empty, so they

\* Saccardo, loc. cit.

presumably germinate at once. They measure when just wetted  $52 - 45 \times 24 - 22\mu$ .

This is possibly *Puccinia pulvinata*, though the measurements given by De-Toni are greater than mine ( $68 - 51 \times 38 - 35\mu$ ).

### PHRAGMIDIUM.

#### PHRAGMIDIUM LACEIANUM, n. s.

On *Potentilla argyrophylla*, Wall.

I first received specimens of this plant harbouring a parasite from Mr. Lace, who gathered them in Bashahr. Subsequently I found specimens myself at Narkanda, and Dr. J. Murray procured specimens at Sarhan in Kulu.

The *uredo pustules* are hypophyllous, brilliantly orange red, discrete, but often so numerous as to give an appearance of coalescence. Each individual pustule is circular and minute. The *spores* are round to oval or pyriform, bright orange red, spiny, and measuring when just wetted  $24 - 20 \times 18 - 16\mu$  (Pl. IV, fig. 3).

The *teleutospore pustules* are also hypophyllous, black, circular, discrete. The *spores* are deep brown, on stalks which narrow gradually away from the spore. They are mostly five-celled; but some are four and some six-celled. The surface is apparently smooth, the free end rounded and slightly thickened, with usually a minute colourless papilla. When just wetted they measure  $132 - 94 \times 50 - 41\mu$ . I could not detect any germ pores; and they would not germinate immediately after ripening.

The specimens sent by Mr. Lace, and those collected by myself were on the red flowered variety, whilst those collected by Dr. Murray were on the yellow flowered variety. This fact may tend to confirm the view taken in Hooker's Flora of British India that these two are varieties of the same species.

This fungus is, I think, distinct from any of the three noted in Saccardo's Sylloge as inhabiting species of *Potentilla*. It is not *Phr. Fragariastris*, D. C., which has warty teleutospores,  $75 - 45\mu$  long and 3-5 celled. It is not *Phr. Potentillae*, Pers. which has smooth teleutospores,  $90 \times 26\mu$ , and 3-7 celled. And it is not *Phr. Tormentillae*, Fuck. which has spores often bent,  $115 \times 28\mu$ , 3-8 celled, and light brown.

#### PHRAGMIDIUM NEPALENSE, n. s.

On *Potentilla nepalensis*, Hook.

I found this host in September attacked with a *Phragmidium* at Mattiana, some miles towards the interior from Simla. The host at

that time was in flower and held both uredo- and teleutospore pustules. Both pustules were mainly hypophyllous, but a few (especially uredo pustules) were epiphyllous.

The uredo pustules are very brilliantly orange red and circular, but were often so closely aggregated that they ran together. The spores are round or oval, or more or less irregular in shape, and bright orange red (Pl. IV, fig. 2). They varied much in size,  $28 - 22 \times 22 - 17\mu$ . There were no paraphyses.

The teleutospore pustules are much smaller and appear like minute black dots scattered about irregularly. The spores are very dark brown, generally constricted at the septa, apparently with 2-4 pores to each cell, 2-5 celled, but usually 4 celled, with a small and inconspicuous mammilla at the free end, looking more like a slight general thickening of the epispore (Pl. IV, fig. 2). The stalk is long, thin, and inflated at some distance from the attachment to the spore, the inflation containing orange red matter. Normal 4 celled spores measured when just wetted  $68 - 66 \times 26\mu$  and a 3 celled spore  $54 \times 24\mu$ .

Of the three species of *Phragmidium* on species of *Potentilla* described by De-Toni\* only one, namely, *Phr. Fragariastris* has so few cells to each spore, and the one I have just described is, I think, not identical with it. I have therefore named it *Phragmidium nepalense*.

#### PHRAGMIDIUM OCTOLOCLARE, n. s.

On *Rubus rosae-folius*, Smith.

The general appearance of the teleutospore stage of this fungus (the only one I know it in) is very like that of *Phr. Barclayi*, Dictel,† with somewhat large circular pulverulent hypophyllous pustules.

The teleutospores are dark brown 7-9 celled usually, but mostly 8-celled. The surface is distinctly and coarsely tuberculated, and at the free end there is sometimes a minute colourless papilla, but often none. The stalk is long, swells up somewhat in water, is inflated away from the spore, and this lower part of the stalk swells more than the upper part adjoining the spore (Pl. IV, fig. 1). The stalk is not unlike that of *Phr. Barclayi*. After lying 24 hours in water the gelatinous sheath shrinks upwards towards the spore, leaving a central axis with orange red swellings at the ends. The spore is constricted at each septum to a slight degree. Each cell of the spore is more flattened from above downwards than in the last mentioned species, the vertical depth of each cell being  $10\mu$  against  $14\mu$  in *Phr. Barclayi*. The spores (taking

\* Saccardo, *loc. cit.*

† I incorrectly regarded it as *Phr. Rubi*, Pers., in my Descriptive List.

those which have 7–9 cells) measure when recently wetted  $130 - 94 \times 23 - 25\mu$  but exceptionally a spore of only two cells may be found, measuring  $44 \times 24\mu$ . I have not observed the germination of these spores; but some spores collected in autumn and put into water did not germinate, and from this I conclude that they must rest. On the other hand some of these spores showed a cell here and there empty; so apparently under special conditions they may also germinate at once.

I am inclined to regard this fungus as distinct from *Phr. Barclayi* and *Phr. quinqueloculare*, mihi. If it be identical with either, it is with *Phr. Barclayi*; but the spores of the latter are usually 6-celled with smooth surface (or with very shallow inconspicuous warts) somewhat less in length and greater in diameter. I am also unable to match it with any of the six species described by De-Toni\* on species of *Rubus*. I propose naming it *Phragmidium octoloculare*.

#### XENODOCHUS.

##### XENODOCHUS CLARKIANUS, n. s.

On *Astilbe rivularis*, Ham.

This fungus was collected by Dr. Clark in the Cheog forest about the beginning of August. On one specimen there were large irregular aecidial patches, especially on the stem, accompanied by hypertrophy, just like that caused by *Phragmidium subcorticium* on *Rosa moschata*. These aecidia were exceedingly brilliantly orange red: they occurred also on leaves. The spores are very bright orange red, in rows, squarish or oblong, densely warted, thickened a little at one end (seen best in empty spores) (Pl. IV, fig. 5). They measure  $31 - 26 \times 26 - 22\mu$ . There were no paraphyses.

But much more numerous were orange waxy looking beds, which to the naked eye resembled *Coleosporium* beds. These in many places simply covered the under leaf surface. I noticed that in some parts these orange waxy beds were gradually changing, and at others had changed into black beds, naked, and under a field lens looking like *Puccinia* beds. The spores from the latter are scraped off with difficulty, and when examined under the microscope presented characters most like those I have read described as *Xenodochus* spores. They have characters, as far as I am able to judge, intermediate between this genus and *Phragmidium*. The spores were in rows, usually 5 to 6 in each row, pale brown, rows being sometimes transversally septate, at others irregularly in various obliquities. The rows of spores were some-

\* Saccardo, loc. cit.

times closely amalgamated with rows on either side. Each spore of a regular row measured about  $16 \times 13\mu$  (Pl. IV, fig. 4). I placed these spores in water, but they refused to germinate.

This is apparently a new species of *Xenodochus*. It differs considerably from *X. carbonarius*, Schlecht. in which the aecidiospores are  $28 - 16 \times 20 - 15\mu$  and among which there are paraphyses. Moreover, in the last named species the teleutospore rows have 10 to 20 loculi.

### MELAMPSORA.

#### MELAMPSORA CILIATA, n. s.

On *Populus ciliata*, Wall.

This host is abundant in Simla, and many are occasionally attacked by a species of *Melampsora*. The uredo stage makes its appearance in August or September.

The uredo pustules are minute and discrete, but often very abundant; they are light yellow, and entirely hypophyllous, with scattered yellow dots on the upper leaf surface. The spores are pale orange red, mostly oval, pretty densely covered with spines, thick walled, and measure when fresh  $30 - 21 \times 22 - 20\mu$  (Pl. V, fig. 15). They are borne singly on stalks, and among them are some capitato paraphyses, with heads very distinctly, and often greatly thickened at the free end (Pl. V, fig. 15).

The teleutospore beds are at first orange red, but become brown later. They are entirely hypophyllous. The spores are in compact beds and each spore measures  $34 - 30 \times 9 - 8\mu$ .

This fungus is, I think, different from any of the three described by De-Toni. This will be apparent when the characters are shown tabularly.

|                               | Uredospores.             | Teleutospores.           | Paraphyses.      | Remarks.                      |
|-------------------------------|--------------------------|--------------------------|------------------|-------------------------------|
| <i>M. Tremulae</i> , Tul.     | $24 - 15 \times 18 - 13$ | $55 - 45 \times 12 - 11$ | Clavate, 9 - 15. | epiphyllous.<br>hypophyllous. |
| <i>M. aecidioides</i> , D. C. | $24 - 17 \times 17 - 15$ | ?                        | Clavate.         |                               |
| <i>M. populina</i> , Jacq.    | $38 - 28 \times 20 - 15$ | $45 - 40 \times 13$      | Capitate, 20-17. |                               |
| <i>M. ciliata</i> , mihi ...  | $30 - 21 \times 22 - 20$ | $34 - 30 \times 9 - 8$   | Capitate.        |                               |

#### MELAMPSORA AECIDIOIDES, D. C. ?

On *Populus alba*, Lin.

Mr. Lace sent me specimens of the leaves of this plant collected at an elevation of 8,500 feet on the 30th August. The under surfaces



were almost wholly covered with brilliant orange red pustules, minute and discrete, though from their enormous numbers they at first sight appeared to be coalescing. The upper leaf surface is profusely flecked with yellow discoloured spots. The spores are orange red, thick walled, spiny, and measure when just wetted  $24 - 21 \times 18 - 16\mu$ . There were no teliospores.

It is impossible from the uredo spores alone to determine the exact position of this fungus. Possibly it is *M. aecidioides* which occurs also on *Populus alba*. The uredospore measurements coincide very closely with those I have just described, but *M. aecidioides* has paraphyses whilst the Himalayan form has not.

### ISOLATED AECIDIA.

#### AECIDIUM CUNNINGHAMIANUM, n. s.

On *Cotoneaster bacillaris*, Wall.

I found the leaves of this plant bearing several characteristic *Roestelia* patches first on the Mahasu hill by the road side; then fairly abundantly in Narkanda; and lastly, scarcely in Mashobra. These were found at the end of August. In all these localities, especially Narkanda and Mashobra, I did not see a single *Cupressus* tree, and this inclines me to regard the fungus as distinct from *Gymnosporangium Cunninghamianum*, mihi. The leaf patches were red above, with long filiform peridia on the lower surface, about 3-5 mm. in length. From one to five such patches were found on a single leaf. On superficial examination this fungus looks different from *Gymnosporangium Cunninghamianum*, although the peridium bursts in the same way, namely, by irregular slits on the tube sides. With a field lens numerous spermatogonia could be seen on the upper leaf surface.

The aecidiospores are yellowish brown, round or oval, densely beset with minute and very shallow warts, and with apparently numerous germ pores (the addition of sulphuric acid discloses eight pores). These spores measure  $28 - 26 \times 28 - 24\mu$  (Pl. IV, fig. 7). The peridial cells are paler in colour than the aecidiospores, elongated, separating readily from one another laterally, very spiny (not ridgy), and measure from  $60 - 58 \times 26 - 24\mu$  (Pl. IV, fig. 7). The aecidiospores would not germinate in water.

Had it not been for the absence, as far as I could see, of *Cupressus* trees in the neighbourhood of these aecidial patches, I should have been disposed on the whole to regard this fungus as *G. Cunninghamianum*; and, indeed, this identity is still quite possible, since it is by no means easy to be certain that no *Cypress* tree exists in the forests in those

regions. In support of the view of identity are the manner of dehiscence of the peridium, and the closely corresponding sizes of the aecidiospores and the peridial cells (the former in the case of *G. Cunninghamianum* being on an average  $28.6 \times 24.6\mu$ , and the latter  $70 \times 22\mu$ ). I should note also that the peridial tubes of the aecidium on *Cotoncaster* are somewhat longer than those on *Pyrus* (in the latter they are 1 to 2 mm.)

The only *Aecidium* known on *Cotoncaster* is *Aec. Mespili*, D. C.; but the aecidiospores of this species are  $24 - 19\mu$  in diameter, and I do not think the Simla species can be the same. Until more is known of its life history I propose naming it *Aec. Cunninghamianum*, believing that it will probably prove to be identical with *Gymnosporangium Cunninghamianum*, mihi.

#### ÆCIDIUM MORI, n. s.

On *Ficus palmata*, Forsk.

I found this plant first attacked in a valley to the north of Mashobra, and subsequently in Simla itself during October. The leaves are often densely covered with an orange red eruption. In some cases the whole of the lower leaf surface was a mass of these bright pustules. But although the eruption is mainly hypophyllous it is also largely epiphyllous. With a field lens it is difficult to determine the nature of the fungus. Each spore heap is very minute, but shreds of white tissue are seen about them. Under the microscope however, all doubt ceases, for there are very characteristic peridial cells, and the fungus is consequently an *Aecidium*. But it is a very remarkable one in having so small and inconspicuous a peridium. To the naked eye the fungus resembles a *Uredo* form. The spore beds are scattered irregularly all over the leaf surface; but sometimes on somewhat swollen veins on the petiole and midrib. The aecidiospores are very brilliant orange red bodies, round to oval, and apparently smooth on the surface. When just wetted they measure  $17 - 14 \times 16 - 14\mu$ . The peridial cells are colourless and more delicate than usual. They are mostly six-sided and spiny or tuberculated. They measure  $22 \times 18 - 19\mu$ . I placed some of the aecidiospores in water on the 17th of October, and a few were found to have germinated on the following day. The germ tube is long, simple, and unbranched.

Saccardo mentions a *Puccinia sepulta*, B. et C. on the leaves of a species of *Ficus* from Nicaragua and two *Uredo* forms (*U. Fici*, Cast. and *U. ficicola*, Speg.); but even supposing these *Uredo* forms are really *Aecidia*, the spores of the former are much too large, and those of the latter considerably larger than the Simla fungus to permit of their being considered identical. The Simla species is probably therefore new.

This fungus is identical with that I have described as *Oaeoma Mori*; and as I have subsequently found that the peridium is distinctly present though incoherent, I feel disposed to relinquish the name *Oaeoma Mori* and to substitute *Aecidium Mori*.

*AECIDIUM FLAVESCENS*, n. s.

On *Senecio rufinervis*, D. C.

I found this plant in August bearing an *Aecidium* in the Mashobra woods. The aecidial patches are indicated conspicuously by brown patches with yellow irregular halos around them on the upper leaf surface. On the under surface the peridia are indistinctly seen against the white tomentous natural leaf surface, as they are pale in colour. The peridia are densely aggregated together, and always on the under leaf surface. The tubes are short and open stellately. I counted from one to thirty-two aecidial patches on single leaves. The patches varied from a half to 2 c.m. in diameter. The aecidiospores are oval or round, pale orange red, measuring when well moistened  $22 - 20 \times 16 - 14\mu$ . The peridial cells are almost isodiametric, very rugose on the surface, with short ridges and spines, and measuring  $28 - 22 \times 22 - 20\mu$ . (Pl. IV, fig. 8).

Later in the season leaves in the same locality bore uredospores, and still later teleutospores in the form of *Coleosporium*. I have unfortunately had no opportunity of examining these forms.

Two species of *Aecidia* on species of *Senecio* are noted by Saccardo, *Aec. Huallatinum*, Speg., and *Aec. sclerothecium*, Speg.; but the spores of the Simla species are much smaller than those of either of these two species.

*AECIDIUM AQUILEGIÆ*, Pers. ?

On *Aquilegia vulgaris*, Linn.

Mr. Lace collected this plant on the 9th August, 1890 at an elevation of 10,000 feet bearing an *Aecidium*. The peridia are hypophyllous, forming a patch of yellow below with a paler area above on which spermogonia may be seen with a field lens. The peridia open by a clean regular margin. The peridial cells are angular, almost isodiametric, five to six-sided, spiny and ridgy, and about  $26 \times 20\mu$ . The aecidiospores are round or faceted when just scraped off, tuberculated, and  $24 - 18 \times 18 - 12\mu$ .

This fungus is very possibly *Aec. Aquilegiæ*, Pers. though the spores in the latter are said to be larger ( $30 - 16 \times 20 - 14\mu$ .) and perhaps more spiny.

*ACIDIUM ORBICULARE*, n. s.

On *Olematis grata*, Wall.

„ *orientalis*, Linn.

„ *puberula*, H. f. and T.

This *Aecidium* was sent to me first by Mr. Luce and Dr. Watt, and subsequently I found it myself at Mattiaín on *Olematis grata*.

Aecidial patches were very numerous on stems, petioles, and leaves, causing considerable hypertrophy of stems and petioles, especially on *Olematis grata*. On leaves the peridia were markedly circinate in arrangement, and all were hypophyllous. The peridial tubes were long and cylindrical, and opened at the summit with an almost clean margin, i. e., very minutely serrated. They measured about 0.75 m.m. in length. The spores are bright orange red, densely beset with shallow warts, round to oval or angular,  $25 - 20 \times 20 - 14$  (*Olematis grata*)  $21 - 16 \times 16 - 15$  (*C. orientalis*)  $22 - 19 \times 19 - 15\mu$ . (*C. puberula*).

The peridial cells were in all cases about  $26 - 20\mu$ . in diameter, four to six-sided, with bright orange red matter in their centres, and spiny, (Pl. IV, fig. 6).

This may possibly be the New Zealand *Aec. otagense*, Lindb.; but the only description available to me is the very brief one by De-Toni, from which it is impossible to decide, since no spore measurements are given. The only other *Aecidium* described by De-Toni on *Olematis* is *Aec. Olematidis*; but the description of the peridium is unlike that I have described. The Himalayan species is therefore, I think, distinct. It is possible that this *Aecidium* is related to *Puccinia Wuttiana*, mihi which occurs plentifully on *Olematis Gauriana* and *O. grata*; but in the absence of experimental proof it is impossible to determine.

ISOLATED UREDO FORMS.

UREDO COLEBROOKIAE, n. s.

On *Colebrookia oppositifolia*, Smith.

This fungus was collected by Dr. Watt near Suni in October. The under surfaces of the leaves were almost uniformly orange red in colour from innumerable orange red pustules. These pustules are really distinct, but appear to be coalescing from their great numbers, and from the hairy nature of the leaf surface, in which the spores get entangled. Dr. Watt informed me that showers of red dust fell from the leaves as he picked them. The spores are pale orange red, oval, very spiny, measuring when just wetted  $28 - 20 \times 20 - 17\mu$ . These spores were put into water some few days after collection, but they did not germinate freely; one or two did so, however, throwing out long simple sinuous tubes.

## UREDIO ICHNOCARPI, n. s.

On *Ichnocarpus frutescens*, Br.

This fungus was also collected by Dr. Watt in the same neighbourhood, and at the same time. The leaves bore a few scattered isolated, bright orange red pustules on the under leaf surface. The spores were readily scraped off. They are bright orange red, oval, studded with large coarse warts or spines, and measure when just wetted  $24 - 20 \times 16 - 21\mu$ . Even in empty spores I could not detect any germ pores. Among the scraped off uredospores I saw some immature single celled stalked spores which I imagine are teleutospores (*Uromyces*); but they were too immature to allow of decision. They were colourless at this early stage.

An *Aecidium Apocyni*, Schwein. is known to occur in Carolina, Kansas, and Illinois; but it is impossible as yet to say whether it is in any way related to the Himalayan fungus: probably it is not.

## UREDIO IPOMAEAE, n. s.

On *Ipomaea hederacea*, Jacq.

This plant was collected by Dr. Watt near Sairi in September with numerous, white, irregularly shaped covered pustules on the under leaf surface. On examining the pustules they were found to contain an abundance of white powdery spores. The spores are colourless, round or squarish, apparently quite smooth on the surface, and measuring when just wetted  $20 - 17 \times 16 - 14\mu$ . Although I have placed this fungus here among Uredo forms I should note that it looks much like the *Aecidium* of a *Phragmidium*, differing only in not being coloured.

## UREDIO PILEAE, n. s.

On *Pilea trinervia*, Wt.

I found a few of these plants in the woods at Mashobra early in October, attacked by a Uredo. The pustules were minute, pale yellow, and scattered on the under leaf surface. The spores are oval, very pale yellow, studded with prominent spines, and measured when just wetted  $25 - 20 \times 20 - 14\mu$ . I could find no trace of any teleutospore form up to the middle of October.

## UREDIO EHRETIAE, n. s.

On *Ehretia serrata*, Roxb.

This fungus was collected by Mr. J. S. Gamble on the banks of the Tons river near Chakrata. The leaves are attacked by a Uredinous

fungus of somewhat uncertain nature. Some leaves had circular spots varying in diameter from 1 to 8 m.m., whilst others had large hypertrophies of the petiole as it enters the lamina, and these were uniformly covered with bright orange red pulverulent spores. Transverse sections through the fungus and leaf show that the spores are not borne separately on stalks, but from a cup-like depression like the pit of an *aecidium* without any peridium. There were also numerous superficial spermogonia. The spores are orange red, oval or pear-shaped, very spiny, decidedly thickened at the free end (remining one of the *aecidio-* and *uredospores* of *Puccinia Prainiana*). When just wetted they measure  $38 - 30 \times 22 - 20\mu$ . They become detached without any portion of the stalk adhering. The spores are given off from both surfaces of the leaves. By applying nitric acid I saw that each spore had two germ pores.

This is the first member of the *Boragineae* which I have seen attacked in India by a Uredine. As *Puccinia Rubigo-vera*, or some variety or allied species, is undoubtedly the most prevalent and destructive rust on wheat, barley, and oats in India, I had long looked for some associated form on a Boragineous host, and this not only by personal search, but also by correspondence. I am afraid, however, that this particular Uredine cannot be the associated form I have been looking for, although it is just possible that it is. For although the spores are given off like uredospores, the cup-shaped depressions in which they are formed, the presence of spermogonia, and the hypertrophy of the host's tissue all render it possible that we have here an anomalous *Aecidium*. This question will have to be tested by experiment.

#### UREDIO AGRIMONIAE, D. C.

On *Agrimonia Eupatorium*, Linn.

This plant is frequently found attacked with a Uredo in these regions; but I have never seen a teleutospore stage. The Uredo pustules are hypophyllous, very numerous, and minute. The spores are orange yellow, oval, warty or spiny, and measure  $22 - 17 \times 14 - 13\mu$ , when just wetted.

This is no doubt the widely distributed *Uredo Agrimoniae*.

#### EXPLANATION OF PLATES.

##### Plate IV.

1. Teleutospore of *Phr. octolocularis*,  $\times 220$ .
2. Teleutospore and uredospore of *Phr. nepalense*, former  $\times 220$ , and latter  $\times 350$ .

3. Telento- and uredospores of *Phr. Laccianum*, × 220 and × 350.
4. Telentosporc of *Xenodochus Clarkianum*, × 350.
5. Aecidiospore of the same × 350.
6. Peridial cells of *Aecidium orbiculare*, × 350.
7. Peridial cells and aecidiospores of *Aec. Cunninghamianum*, a × 350,  
b × 220.
8. Peridial cells of *Aec. flavescens*, × 350
9. Telento- and uredospores of *Pucc. Ellisii*, × 350.
- \*10. Telentosporc of *Pucc. Wattiana*, × 350.

Plate V.

11. Telento- and aecidiospores and promycelium of *Phr. quinqueloculare*,  
× 350.
12. Telentosporcs of *Pucc. excelsa*, × 350.
13. Telentosporcs of *Pucc. occulta*, × 350.
- \*14. Telentosporcs of *Pucc. McIntirianus*, × 350.
15. Uredospores and paraphyses of *Melampsora ciliata*, × 350.
16. Telentosporcs of *Pucc. crassa*, × 350.
17. Telentosporcs of *Pucc. caudata*, × 350.
18. Telentosporcs of *Pucc. Castagnei*, × 350.
19. Telento- and uredospores of *Uromyces Vignae*, × 350.

X.—*Notes on the Collection of Snakes in the Indian Museum with descriptions of several new species.*—By W. L. SCLATER, M. A., Deputy Superintendent of the Indian Museum.

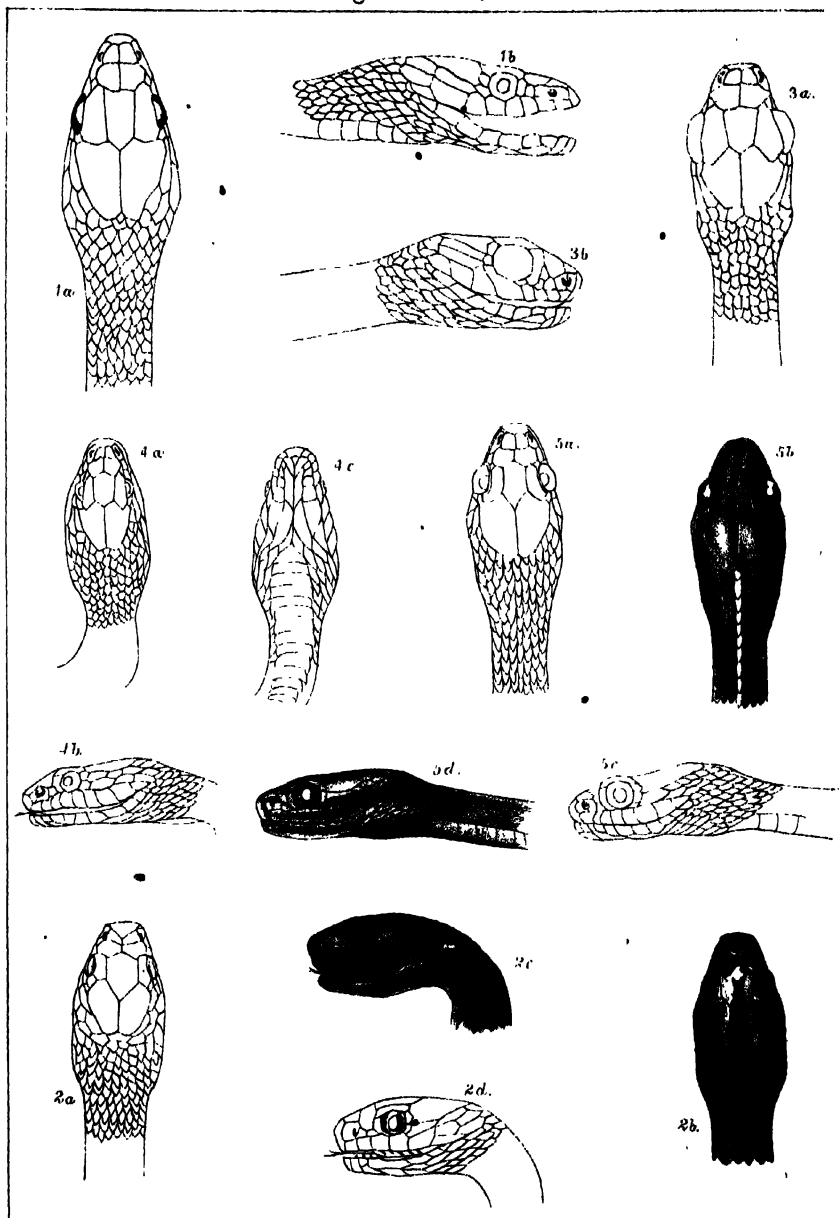
[Received 1st August, 1891; read 5th August, 1891.]

(With Plate VI.)

The following notes were drawn up while critically examining and rearranging the collection of Snakes in the Indian Museum; the collection is a fairly large one though there are many Indian species still unrepresented, and I should be very glad if any one would assist me to fill up the gaps especially in the Southern Indian and Ceylonese forms in which the Museum is specially deficient.

The number of Snakes described by Mr. Boulenger in his work on the Reptiles of the Indian Empire and Ceylon amounts in all to 264, of this number the Indian Museum possesses examples of 196, so that no less than 68 are still wanting to complete the Indian Museum Collection; of the 68 deficiencies, however, 22 at least of the species have only been got once and are represented in the British Museum or elsewhere usually by a single specimen.

\* For descriptions of these, see J. A. S. B., Vol. LIX, Pt. II, No. 2, 1890.



Del. By G. C. Chuckerabutty.

Lith by S.C. Mondu

NEW INDIAN SNAKES.





To the 264 snakes given in Mr. Boulenger's work I have now eleven to add, of which five are new, and described here for the first time and six are exotic species now recorded from the Indian Empire for the first time, so that the total number of Indian Snakes is now raised to 275.

The Indian Museum possesses a fair number of types, but unfortunately several which I believe should be here are no longer to be found in the collection, such is the case with *Typhlops andamanensis*, Stoliczka, *Calamaria catenata*, Blyth, and several others.

The following is a list of the species, twenty-one in number, of which the types are still in the Museum.

|   |  |
|---|--|
| <i>Typhlops theobaldianus</i> , Stol.   | <i>Coluber prasinus</i> , Bly.           |
| <i>Trachischium fuscum</i> , (Bly.)     | <i>Pseudoxenodon macrops</i> , (Bly.)    |
| „ <i>tenuiceps</i> , (Bly.)             | <i>Tropidonotus platyceps</i> , Bly.     |
| <i>Blythia reticulata</i> , (Bly.)      | „ <i>nigrocinctus</i> , Bly.             |
| <i>Lycodon gammiei</i> , (Blanf.)       | <i>Dipsas multifasciatus</i> , Bly.      |
| <i>Hydrophobus davisoni</i> , (Blanf.)  | <i>Hypsirhina blanfordi</i> , Boul.*     |
| <i>Pseudocyclophis bicolor</i> , (Bly.) | <i>Distira tuberculata</i> , (Anders.)   |
| <i>Ablabes scriptus</i> , Theob.        | <i>Amblycephalus modestus</i> , (Theob.) |
| „ <i>nicobarensis</i> , Stol.           | „ <i>macularius</i> , (Bly.)             |
| <i>Zamenis ladaccensis</i> , Anders.    | <i>Trimeresurus cantoris</i> , Bly.      |
| <i>Zaocys nigromarginatus</i> , (Bly.)  |  |

To these must be added the types of the five new species described below.

|                                 |                                   |
|---------------------------------|-----------------------------------|
| <i>Ablabes stoliczkae</i> .     | <i>Tropidonotus pealii</i> .      |
| <i>Simotes woodmasoni</i> .     | <i>Tropidonotus nicobaricus</i> . |
| <i>Zaocys tenasserimensis</i> . |                                   |

There are also in the Indian Museum the types of the following species found on the borders of the Indian Empire but not yet recorded from within its limits.

|                                       |   |
|---------------------------------------|---|
| <i>Typhlops persicus</i> , Blanf.     | <i>Pseudocyclophis persicus</i> , (Anders.) |
| <i>Calamaria stallenechti</i> , Stol. | <i>Dipsas rhinopoma</i> , Blanf.            |

The total number of types therefore in the Indian Museum is thirty.

It is only due to Mr. Boulenger to add that it is entirely owing to his useful and excellent manual on Indian Reptiles in the Indian Fauna series that I have been able to work out and rearrange the Snakes in the Indian Museum, so much has been done since Günther's Reptiles of British India appeared and that scattered over so many various separate works and periodicals.

The Snakes in the Museum are now arranged in accordance with

\* Originally described by Blanford as *H. maculosa*, name changed by Boulenger.

Mr. Boulenger's work, and a complete list of them will shortly be published, in the meantime the following notes may be found useful.

*TYPHLOPS DIARDI*, Schleg., Boulenger, p. 238.

*TYPHLOPS BOTHRIORHYNCHUS*, Günth., Boulenger, p. 239.

I have found it difficult to separate these two species, in fact the only distinction pointed out by Boulenger is the presence of the pits below the nostrils, these I have found vary considerably in depth and conspicuousness; all the specimens of *T. bothriorhynchus* in the Indian Museum were procured in Assam where *T. diardi* also seems to be most abundant; it would therefore seem possible that this pit might be a sexual or seasonal mark, and that these two species are really one and the same.

*TYPHLOPS THEOBALDIANUS*, Stol., Boulenger, p. 240.

Of this species, which seems to be unrepresented in the British Museum Collection, the Indian Museum possesses two examples, one the type, the history of which is unknown, and a second procured by Capt. J. Butler at Samagooting in the Naga hills.

*TYPHLOPS ACUTUS*, (Dum. et Bibr.), Boulenger, p. 241.

This species is not confined to Southern India, it extends to Bengal, and the Indian Museum contains specimens from Sipri in Gwalior, Chyabassa in Chōta Nagpur, Calcutta and Krishnaghur.

*PYTHON MOLURUS*, (Linn.), Boulenger, p. 246.

Boulenger does not mention whether the present species extends to China, Günther also expresses a doubt on the subject, the matter may now be settled as the Indian Museum possesses an undoubted specimen of *P. molurus* procured by Surgeon-Major Hungerford at Haiphong (Hiao-fung?) near Shanghai.

*SILYBURA NIGRA*, Beddome, Boulenger, p. 263.

*Silybura wood-masoni*, Theobald (Cat. Rept. Brit. Ind., p. 135) the type of which is in the Indian Museum, seem rather referable to *Silybura nigra* than to *S. pulneyensis*.

*SILYBURA BREVIS*, Günth., Boulenger, p. 268.

This species extends northwards to the Ganjam hills, whence the Museum possesses a specimen presented by Col. R. H. Beddome.

*CALAMARIA CATENATA*, Blyth, Boulenger, p. 282.

The type of this species is no longer in the Museum, it had apparently disappeared before the collections of the Asiatic Society were transferred to the Indian Museum, as is mentioned by Theobald in his Catalogue of Reptiles in the Asiatic Society's Museum so that unless the species is rediscovered in Assam, nothing further can be known about it beyond what is contained in Blyth's rather meagre description.

*CALAMARIA SUMATRANA*, Edeling, *Natuur. Tijdsch. Ned. Indië* xxxi, p. 379, (1870).

A specimen of this apparently rather rare snake from Singapore presented to the Museum by Mr. Davison, was kindly identified for me by Mr. Boulenger; it has hitherto been known from Sumatra only.

*TRACHISCHIUM GUENTHERI*, Boulenger, p. 285.

There are three snakes in the Indian Museum which seem referable to this species, one from Katmandu in Nepal and two labeled "Allahabad J. Cockburn," the latter probably came from Naini Tal as there are other Himalayan snakes in the collection presented by Mr. Cockburn labelled Allahabad; it is probable therefore that this is the more western representative of *Trachischium fuscum* from which it differs merely in colouration and the number of ventral shields.

*TRACHISCHIUM RUBRIVENTER*, (Jerdon), Boulenger, p. 286.

The type of this species does not seem to be in the British Museum as the species is "unknown to Mr. Boulenger," neither have I been able to find it among the specimens in the Indian Museum, unless therefore the species is rediscovered, nothing further can be known about it.

*LYCODON STRIATUS*, (Shaw), Boulenger, p. 292.

*LYCODON TRAVANCORICUS*, (Bedd.), Boulenger, p. 293.

There are no specimens of *L. striatus* in the Museum from Southern India, the localities from which there are specimens are the hills below Simla, Jemmer in Sind, Lahore, Agra, Ajmere, Rajputana, and the Ganjam district; the species is recorded from the Anamalai hills by Günther, but this was before *Lycodon travancoricus* which resembles *Lycodon striatus* very strongly had been discriminated; of this species (*S. travancoricus*), the Museum possesses examples from the Nilgiri hills, the South Arcot district and Tinnevely hills, it therefore appears probable that it entirely replaces *S. striatus* in the southern part of the Indian Peninsula.

*LYCODON FASCIATUS*, (Anders.), Boulenger, p. 295.

The Indian Museum possesses two specimens of this rather rare species, one from Shillong in the Khasia hills collected by the late Major Cock, and one from Tezpur obtained by Col. Godwin-Austen; the species has been hitherto recorded only from the Nakhien hills and Western Yunnan.

*POLYODONTOPHIS BISTRIGATUS*, (Günth.), Boulenger, p. 304.

The geographical area of this species can be extended to the Nicobars whence there is an example procured by Mr. de Roepstorff.

*ABLATES STOLICZKAE*, sp. nov. Pl. VI, fig. 1.

Rostral shield broader than deep, the part visible from above about two-thirds the length of the internasals; internasals shorter than the prefrontals and somewhat triangular, frontal hardly as long as its distance from the end of the snout, and a good deal shorter than the parietals; nostrils rounded, about the middle of the length of an undivided shield which is quite three times as large as the loreal; this latter is very small and squarish; one preocular not reaching the upper part of the head, two postocular both in contact with the parietals; eye of moderate size, about half the length of the snout; temporals 1 + 2; upper labials eight, fourth and fifth entering the eye; four lower labials in contact with the anterior chin shields which are about as long as the posterior. Scales smooth, in fifteen rows. Ventrals 153-4, subcaudals 116-9. Anal divided. Colour light olive-brown above, lighter olive yellow below, the two colours separated in front by a conspicuous broad longitudinal black streak, extending from just in front of the eye back along the neck for an inch or so.

There are two specimens of this species in the Museum. One procured at Samagooting in the Naga hills of Assam by Capt. J Butler, the other to which no locality is attached but which was received from Dr. F. Stoliczka of the Geological Survey.

This species differs from all the Indian species of *Ablates* described by Boulenger, except *Ablates calamaria*, in having a single nasal shield; in all the other species of the genus the nasal shield is divided or semi-divided.

From *A. calamaria* to which it is most nearly allied, it differs in having a loreal distinct from the nasal shield, in having both postoculars in contact with the parietal and in the much larger number of subcaudals, 116-9 against 64-76 in *A. calamaria*.

*ABLABES DORIAE*, (Boul.), Boulenger, p. 306.

The Indian Museum is indebted to Mr. R. D. Oldham of the Geological Survey for a specimen of this rather rare snake which he procured in Manipur.

*ABLABES COLLARIS*, (Ménétries), Blanford, Persia, p. 405.

Two snakes collected by Dr. Anderson in Palestine near Lake Galilee seem referable to this species; they agree very well with the description given by Blanford (*l. c.*) of a Persian specimen in the Genoa Museum except that in the Palestine specimens, the posterior chin shields are slightly smaller than the anterior ones, whereas in the Persian specimen the chin shields are said to be equal in size; the allied species *Ablabes modestus* has been recorded from Palestine, but not so far as I am aware the present one.

*SIMOTES CYCLURUS*, (Cantor), Boulenger, p. 311.

The type specimens of *Simotes obscurus* and *Simotes crassus* are undoubtedly both faded specimens of this species, as was surmised by Boulenger (*l. c.*); with regard to some of the specimens in the Museum, it is very difficult to say, whether they should be referred to this species or *S. albocinctus*, since the number of anterior temporals and labials entering the eye seem to vary somewhat, so that some of the examples are coloured like one species, but scaled like the other, possibly this may be due to hybridism.

Judging from the specimens of these two snakes in the Indian Museum, it would appear that *S. cyclurus* was an inhabitant of higher lands than *S. albocinctus*.

*SIMOTES PURPURESCENS*, (Schleg.), Boulenger, P. Z. S. 1890, p. 34.

This species with which according to Boulenger (*l. c.*) *Simotes trinotatus*, Dum. et Bibr., *S. labuanensis*, Günth., *S. catenifer*, Stol. and *S. dennysi*, Blanf., are conspecific, may now be included among the snakes of the Indian Empire, since a specimen was procured by Dr. Anderson from Tavoy in Tenasserim and is now in the Museum.

*SIMOTES WOOD-MASONI*, sp. nov. (Plate VI, fig. 2.)

Nasal divided; portion of the rostral seen from above a little shorter than its distance from the frontal; suture between the internasals shorter than that between the prefrontals; frontal longer than its distance from the end of the snout, as long as the parietals; loreal small, longer than deep; one preocular, one subocular separating the third labial from the

eye margin, two postoculars; temporals 1 + 2; six upper labials, the fourth alone entering the eye, the fifth the largest; four lower labials in contact with the anterior chin shields; posterior chin shields small, less than half the size of the anterior. Scales in 17 rows. Ventrals strongly angulate, 180-6. Anal undivided. Subcaudals 57.

Colour; adult, above brick reddish with traces of a dorsal and three lateral narrow lighter longitudinal lines; below dusky reddish with a light longitudinal line on either side at the angle of the ventrals; head with a dark median longitudinal mark extending back from the anterior end of the frontal to the nape where it bifurcates into the ground colour of the back, an oblique dark streak across the anterior nasal and the three anterior labials; a second oblique streak from the 4th and 5th labials through the eye above which it bifurcates and meets its fellow from the opposite side, a third oblique streak across the parietals and the sides of the neck. In the young the markings are much more conspicuous, the lighter colour being yellow and contrasting strongly with the darker brown of the markings.

This species is most nearly allied to *Simotes violaceus* and *S. octolineatus*; from the former species it differs in the reduced number of its labials, of which only the fourth enters the eye, and also in colouration.

From *S. octolineatus* it differs in having a subocular which excludes the third labial from the eye and in possessing only a single anterior temporal; in colouration, however, especially of the young, the two species much resemble one another.

There are two examples of this species in the Indian Museum, from which this description was drawn up, one from the Andamans collected and presented by Mr. Wood-Mason, and one from the Nicobars where it was procured by the late Mr. F. A. de Roepstorff.

*SIMOTES TREOBALDI*, Günth., Boulenger, p. 318.

The Indian Museum contains four examples of this rather uncommon species, from Mandalay (Anderson), from Meiktalla (Collett), and from Mergui.

*SIMOTES PLANICEPS*, Boulenger, p. 316.

An example of this snake was procured by Dr. Anderson during one of his two expeditions to Yunnan and Upper Burma, which had apparently never been named or described; unfortunately the specimen is without locality, though it no doubt comes from Upper Burma; the species has hitherto been known from a single specimen only, procured by Fea at Minhla in Burma.

*OLIGODON DORSALIS*, (Gray), Boulenger, p. 318.

The range of this species may be extended from the Khasia hills south to the Naga and Chittagong hills whence the Indian Museum possesses examples procured by Capt. J. Butler and Mr. Bruce respectively.

*OLIGODON SUBLINEATUS*, Dum. & Bibr., Boulenger, p. 320.

Two examples of this species indistinguishable from the typical Ceylon specimens were got by Mr. de Roepstorff in the Nicobars and are now in the Museum.

*OLIGODON SUBGRISEUS*, Dum. & Bibr., Boulenger, p. 321.

This typically Indian species has spread over the natural boundaries of India as far as Killa Abdulla near the Khojak Pass in British Baluchistan whence the Museum possesses a specimen presented by Mr. J. A. Murray.

*OLIGODON MELANOCEPHALUS*, (Günth.), Boulenger, p. 317.

Gunther (P. Z. S. 1864, p. 491) and Jan. (Icon. Ophid. livr. xiii, pl. iii, fig. 4, Oct. 1865), seem to have described and figured the same snake independently under the same specific name, the former making a new genus for its reception, the latter including it in the genus *Humolosoma*.

The examination of a specimen brought by Dr. Anderson from Sebastiyeh (Samaria) in Palestine confirms Boulenger in placing the species in the genus *Oligodon*.

*DIAGERHIS PRODUCTA*, (Gerv.), Peters Monatsb. Akad. Berlin, 1862, p. 275; Murray, Ann. Mag. N. H. (5) xiv, p. 104.

This rather curious snake was described by Peters (*l. c.*) from Senaar in N. E. Africa, and has since been recorded by Murray from Tanjistan and Bushire in Persia; one of the Tanjistan specimens is now in the Indian Museum and agrees with Peters' description in every respect.

*ZAMENIS KORROS*, (Schleg.), Boulenger, p. 324.

There is an undoubted example of this species in the Indian Museum said to have been procured by Dr. E. F. Keleart in Ceylon; Anderson quoting from Ferguson's "Reptile Fauna of Ceylon" states that this species is not found in Ceylon; it is possible therefore that the specimen in question may be wrongly labelled though there does not seem to be any particular reason for this being the case.



*ZAMENIS VENTRIMACULATUS*, (Gray), Boulenger, p. 325.

*ZAMENIS LADACCENSIS*, Anderson, Boulenger, p. 326.

There are no specimens of *Z. ventrimaculatus* in the Indian Museum from Persia or anywhere outside the Indian Empire. The Museum possesses examples from the following localities. Below Simla, Sabathu, Rajanpur in the Punjab, Jeypore Rjpt., and Karachi. Of *Z. ladaccensis* the Indian Museum possesses specimens from Shiraz (including the type of *Gonyosoma dorsalis*, Anders) Bushire, Karman and Regan in Persia; Askan, Zamran, Hung, and Quetta in Baluchistan; Gilgit and Ladak.

If this really represents the true distribution of the two species their geographical areas are quite separate and the two species may be considered quite distinct.

*ZAMENIS DIADEMA*, (Schleg.), Boulenger, p. 328.

The distributional area of this snake may be extended eastwards as far as Allahabad perhaps as far as Purneah, as there is a specimen probably from the latter place in the Indian Museum.

*ZAOCCYS TENASSERIMENSIS*, sp. nov. (Plate VI, fig. 3.)

Rostral as broad as deep, just visible from above; suture between the internasals two-thirds of that between the pre-frontals, frontal longer than its distance to the end of the snout, shorter than the parietals; three loreals, one larger anterior, and two smaller posterior; one long and narrow preocular reaching the top of the head but not touching the frontal; one subocular below it wedged in between the fourth and fifth labials; two postoculars; a single pair of long temporals on either side, the posterior temporals not larger than the ordinary scales; upper labials 7 to 8 in number, one very large labial alone entering the eye; in the specimen described this is on one side the fourth, on the other the fifth; five lower labials in contact with the anterior chin shields which are equal to the posterior; scales in sixteen rows all smooth, the two median dorsal rows and the two outer rows adjoining the ventrals on either side are more or less broad and quadrangular, whereas the five intermediate rows on either side are narrow and oblique. Ventrals not angulate, 201; Subcaudals 123; anal divided.

Colour, black above to greenish olive on the head, anteriorly traces of a white vertebral line, in the middle part of the body a series of ill defined white transverse bands bordered with black posteriorly, on the hinder part of the body, the bands are gradually transformed into seven longitudinal series of white spots separated by a black network, of the series of spots the outer series on either side are on the ventrals; below

yellowish the outer edges of the ventrals dusky, tail with a median dusky streak.

This snake is quite different from the only other Indian species of the genus, *Z. nigromarginatus*; in fact it belongs to the other section of the genus characterized by Günther by the possession of three loreals and named by him *Zapyrus*.

It seems to most resemble *Zaocys fuscus* from Borneo, but differs from this snake in colouration and also in the number and position of upper labials.

**COLUBER HELENA**, Daud., Boulenger, p. 331.

The range of this snake extends somewhat beyond the limits imposed by Boulenger; the Indian Museum possesses examples from the Purneah district and Mutlah in Bengal and from Samagooting in Assam.

**COLUBER RETICULARIS**, Cantor, Boulenger, p. 332.

The range of this species too may be extended from Sikkim and Assam southwards to Arakan and Pegu whence the Museum possesses specimens.

**COLUBER TAENIURUS**, (Cope), Boulenger, p. 333.

*Coluber nuthalli*, Theobald (Cat. Rept. As. Soc. Mus., p. 51) the type of which is in the Indian Museum, is obviously a young specimen of *O. taeniurus* and is not identical with *Coluber helena* as suggested by Boulenger.

**COLUBER RADIATUS**, Schleg., Boulenger, p. 333.

The Indian Museum possesses examples of this snake from Backergunge in Lower Bengal (E. Taylor) and from Hong Kong, from neither of which localities is this species recorded by Boulenger.

**COLUBER PRASINUS**, Bly., Boulenger, p. 334.

**COLUBER OXYCEPHALUS**, Boie, Boulenger, p. 335.

There are in the Museum examples of both these snakes from Darjeeling (Gammie) whence they are not recorded by Boulenger.

**TROPIDONOTUS CHRYSARGUS**, Schleg., Boulenger, p. 345.

**TROPIDONOTUS NIGROCINCTUS**, Bly., Boulenger, p. 346.

The distinction given by Boulenger in his key between these two species I find to be by no means a constant one; several of the specimens of *Trop. nigrocinctus* in the Museum possess two anterior temporals; the

colouration, however, of the two species is very distinct, the three oblique black streaks, below the eye, behind the eye and on the neck at once distinguishing *Tropidonotus nigrocinctus* from its ally.

*TROPIDONOTUS HIMALAYANUS*, Günth., Boulenger, p. 347.

This species is much more distinct from *T. subminiatus* than would be gathered from a perusal of Boulenger's description; *T. himalayanus* is much darker and very nearly always retains traces of the dorso-lateral series of white and black spots which are always found in the young, whereas in *T. subminiatus* the ground colour above is much lighter, almost blue, and very seldom retains any traces of the spots; in *T. himalayanus* the labials are all light coloured, edged with black and the oblique dark streak, under the eye so conspicuous a feature in *T. subminiatus* is altogether absent; the ventral surface in *T. himalayanus* is very dark, in some specimens almost black, whereas in *T. subminiatus* it is never dusky.

In none of the large number of specimens of *T. subminiatus* which I have examined, is there any trace of the keels on the outer row of scales, in *T. himalayanus*, however, the outer row of scales is as often keeled as not, and sometimes almost as strongly as in *T. chrysargus* and *T. nigrocinctus*.

The Indian Museum possesses examples of *T. subminiatus* from Sikhim, the Garo, Khasia and Naga hills, Manipur, Yunnan, Burma and from throughout Tenasserim; of *T. himalayanus* from Darjeeling (3000 to 4000 feet), the hills of Assam and Moulmein in Burma.

*TROPIDONOTUS PLUMBICOLOR*, Cantor, Boulenger, p. 351.

As is so often the case with Southern Indian forms, this species extends its range northwards to Mt. Aboo in Rajpootana; the Indian Museum also possesses examples from Nowgong and the Upper Godavery district in the Central Provinces, from the Nilgiri, Anamalai and Tinnevely hills in S. India and from Galle in Ceylon.

*TROPIDONOTUS ANGUSTICEPS*, Blyth, J. A. S. B. xxiii, p. 295; Boulenger, p. 352.

Three bottles containing four snakes were found amongst the collection of the Indian Museum labelled *Tropidonotus angusticeps*, of these snakes one was obviously *T. piscator* and does not seem to have been one of Blyth's original specimens; of the others, two with no history attached are without doubt examples of *Tropidonotus hydrus*, and the fourth, which was said to be the actual type of *T. angusticeps* collected by Capt. Abbott

in Ramri Island on the Arakan coast is a very faded specimen of *Pseudozenodon macrops*.

The description of *T. angusticeps* seems to refer to both the latter species, *T. hydrus* and to *Pseudozenodon macrops*.

**TROPIDONOTUS PEALII, sp. nov. (Plate VI, fig. 4.)**

Eye moderate, its diameter hardly equal to its distance from the nostril; rostral just visible from above; internasals broadly truncated anteriorly, suture between them shorter than that between the prefrontals; frontal longer than its distance to the end of the snout, shorter than the parietals; loreal nearly square; 1-2 preoculars; 2-3 postoculars; temporals 2 + 2; upper labials nine, fourth and fifth entering the eye; five pairs of lower labials in contact with the anterior chin shields, which are shorter than the posterior. Scales in 19 rows, strongly keeled, outer row also keeled but not so strongly as the rest; ventrals 142-144, subcaudals 75-77, anal entire.

Colour in spirit dark brown above, with a narrow light longitudinal line on either side, edged rather darker reaching the length of the body, below on either side occupying the lateral scales bordering the ventrals another light and much broader band two scales wide; head dark brown above, the upper and lower labials and rostral yellow, edged and blotched with brown, ventrals very dark brown each tipped laterally with light yellow, the longitudinal band so formed enlarges anteriorly to form a large white mark under the posterior lower labials; an indistinct yellow line along the middle of the ventral shields rather more conspicuous posteriorly.

Total length, 20 in.; tail 5 in.

This species is a very well marked one in every way; it differs from all the other Indian species (except *T. plumbeicolor*?) in having an undivided anal shield; apart from this it is perhaps somewhat allied to *Tropidonotus parallelus* with which it agrees in having a small eye and the outer row of scales keeled.

There are in the Indian Museum two examples of this snake, both collected in the Sibsagar district of Assam by Mr. S. E. Peal, who has contributed very largely to our collection of snakes and after whom I have much pleasure in naming this fine new species.

**TROPIDONOTUS NICOBARENSIS, sp. nov. (Plate VI, fig. 5.)**

Eye large, its diameter exceeding its distance from the nostril; nostril just visible from above; internasals truncated suture between them and between the prefrontals about equal in length; frontal longer than its distance to the end of the snout, very nearly as long as the parietals;

loreal squarish; one large preocular reaching the top of the head, but not touching the vertical; three postoculars; temporals 1 + 2, the posterior pair very much smaller than the anterior and hardly larger than the scales around; upper labials 7 or 8, the third and fourth, or fourth and fifth entering the eye; five pairs of lower labials in contact with the anterior chin shields which are much shorter than the posterior ones. Scales in 19 rows strongly keeled including the outer row; ventrals 162; subcaudals 119; anal divided.

Colour, above bluish olive with a longitudinal dorsal band from the nape to the tail about two scales wide bordered on either side by a narrow black line, another indistinct white line laterally on either side, head uniform, a black streak behind the eye; below lighter than above, uniform; chin, upper labials and snout yellowish without the bluish tinge.

The only example of this new species is one from Camorta in the Nicobars, procured there by Mr. de Roepstorff.

I have referred this snake to *Tropidonotus*, but I am by no means certain that it is properly there located; the only example in the Museum is a small and obviously young one, and I cannot make out that there is very much difference in the size of the maxillary teeth, and the number of subcaudals is very high for this genus; the only species which it seems to resemble at all is *Prymniodon chaldeus*, Cope (Günther, Reptiles Brit. Ind. p. 274) which is said to have come from Siam; with the description of this species in Günther, it agrees admirably except in the two important characters of the dentition and the anal shield.

The maxillary teeth of *Prymniodon* are said to be very considerably larger anteriorly than posteriorly, and the anal shield is entire; in the species before me the maxillary teeth appear to be of equal length throughout, and the anal is divided; it is therefore impossible to identify the Nicobar species with *Prymniodon* and I have thought it best, until more specimens are forthcoming to leave it in the genus *Tropidonotus*.

*TROPIDONOTUS RHODOMELAS*, Boie, Blanford, P. Z. S. 1881, p. 221.

*Tropidonotus mortoni*, Theobald, (Cat. Rept. As. Soc. Mus. p. 57) is referable to this species of which we have examples from Singapore and Sinkip Island, Sumatra.

*TROPIDONOTUS TRIANGULIGERUS*, Schleg., Anderson, Journ. Lin. Soc. xxi, p. 345.

This snake was obtained by Dr. Anderson in Mergui and the Museum also contains examples from North Tenasserim, the Malay Peninsula and from Sinkip Island, Sumatra; it is not mentioned by Boulenger, and must be added to the Indian Fauna.

*DIPSAS MULTIFASCIATA*, Blyth, J. A. S. B. xxix, p. 114.

This species, the type of which was described by Blyth, from Subathu near Simla in the North-West Himalayas, was afterwards identified by Stoliczka (J. A. S. B. xxxix, p. 199) with *D. ceylonensis* a species which is otherwise apparently confined to Southern India and Ceylon.

I cannot agree with Stoliczka with regard to this identification, in the first place the preocular shield which extends nearly to the vertical in the case of *D. ceylonensis*, does not or barely reaches the top of the head in *D. multifasciata*; again in none of the specimens of *D. ceylonensis* which I have been able to examine is there the slightest trace of the narrowing of the preocular shield below, so that the lower corner of the loreal enters the eye, this arrangement is found more or less markedly in all the specimens of *D. multifasciata*; finally the colouration of the two species is very different, though perhaps difficult to describe.

The following shows at a glance the difference between the two species, the characters being taken from an examination of the specimens in the Museum:—

*Dipsas multifasciata.*

Loreal entering the eye below the preocular except in two cases where the lower corner of the loreal is prolonged in that direction, but does not quite reach it.

Preocular barely reaching the top of the head in some cases.

Temporals 1+2 or 2+1.

Scales in 21 rows.

Ventrals 231-248. Subcaudals 96-109.

Head with a well marked lateral black band from the prefrontals to the end of the parietals.

A median black streak on the nape.

The labials edged with black.

A well marked streak from the eye to the gape.

Ventrals marked with lateral square blotches throughout.

*Dipsas ceylonensis.*

No approach of the loreal to the eye, preocular of equal width throughout.

Preocular reaching the top of the head and sometimes touching the vertical.

Temporals 2+3.

Scales in 19 rows.

Ventrals 221-3. Subcaudals 90.

All the upper head shields black blotched, no definite longitudinal band.

Three ill-defined longitudinal black bands on the nape generally joined by a transverse band behind and forming a trident.

Labials not edged with black.

Streak from eye to gape ill-defined and interrupted.

Ventrals irregularly and very lightly spotted.

Of *Dipsas ceylonensis*, the Indian Museum possesses examples from the Anamalai hills only; of *D. multifasciata* besides the type from Subathu near Simla examples from Mussooree, Naini Tal and Darjeeling.

**DIPSAS CYANEA**, (Dum. & Bibr.), Boulenger, p. 361.

This species occurs in Tonasserim; there is an example in the Indian Museum from Tavoy.

**DIPSAS CYNODON**, Cuv., Günther Reptiles Brit. Ind., p. 368.

This species must be added to the fauna of the Indian Empire; there are in the Indian Museum undoubted examples from the Garo hills (Capt. Williamson), Samagooting (Capt. Butler) and Cachar (Museum Collector) in Assam; and from Thyetmyo (W. T. Blanford) the Burma-Siam hills (Museum Collector), and Mergui (W. Theobald) in Burma; this species is recorded from two of the above localities by Theobald in his Catalogue of the Snakes of the Asiatic Society, and it seems curious that this should have been overlooked by Boulenger.

**DRYOPHIS FRONTICINCTUS**, Günth., Boulenger, p. 368.

There is a snake in the Indian Museum from Sibsagar in Assam presented by Mr. S. E. Peal which I am unable to identify with any other species; if this is the case it cannot be that this snake is confined to the neighbourhood of brackish water as is suggested by Stoliczka.

**DRYOPHIS MYCTERIZANS**, (Daud.), Boulenger, p. 370.

This snake like many other Southern Indian species extends north-westwards as far as Mt. Aboo in Rajputana.

**DRYOPHIS PULVERULENTUS**, (Dum. & Bibr.), Boulenger, p. 371.

This species is apparently generally distributed throughout Peninsular India, there are six undoubted examples in the Indian Museum collected by Mr. V. Ball in Maunbhoom.

**CERBERUS RHYNCHOPS**, (Schneid.), Boulenger, p. 374.

This species appears to be common on the Andamans and Nicobars.

**HYPsirrhina blanfordii**, Boulenger, p. 377.

This species is founded on a single specimen described by Blanford as probably from the neighbourhood of Bassein; this unique specimen does not seem to be in the British Museum as Mr. Boulenger distinctly says that he has not been able to examine it; there is, however, an ex-

ample of this species in the Museum with no recorded history, which had been identified by Dr. Anderson as *Gerarda bicolor*, and it is possible that this is the missing type which has lost its label.

*HYPSIRHINA SIEBOLDII*, (Schleg.), Boulenger, p. 377.

This species occurs in Assam; the Indian Museum contains a specimen from Samagooting in the Naga hills.

*FORDONIA LEUCOBALIA*, (Schleg.), Boulenger, p. 378.

This species occurs in the Sunderbunds, there is an example thence in the Museum, presented by the Rev. H. J. Harrison.

*CALLOPHIS NIGRESCENS*, Günth., Boulenger, p. 384.

This species varies considerably in colour, of the specimens in the Indian Museum, there is one referable to the spotted variety (var. A. of Boulenger) from the Wynaad; three of the variety with three longitudinal white-edged bands (var. B. of Boulenger) from Malabar, the Anamalai and the Shevaroy hills; and finally two of the variety with five longitudinal bands from Malabar and Ganjam.

*MEGAEROPHIS FLAVICEPS*, Reinh., Günther Rept. Brit. Ind. p. 346.

This species, which is not mentioned by Boulenger, should be included among the Snakes of the Indian Empire; there is an example of it in the Museum from Mergui in Tenasserim, presented by Mr. W. Theobald.

*BURGARUS CAERULEUS*, (Schneid.), Boulenger, p. 388.

This snake, which is found all over India proper, appears to be very rare on the eastern side of the Bay of Bengal, in fact the Indian Museum possesses what I believe to be the only specimen recorded thence, one procured by Col. Nuthall from Rangoon, and this might have easily reached Burma by ship. Lately, however, the Museum has received a pair of "Kraits" from Meiktalla in Upper Burma where they were found by General H. Collett which differ in some respects from the ordinary Indian form of this snake, although hardly perhaps enough to merit specific distinction.

The following are the points in which this variety differs from the typical Indian form.

The rostral is deeper than broad and extends back to about two-thirds or three-fourths of its distance from the frontal; the ventral shields number 223 and 228 respectively and the subcaudals 49.



The colour above is a dark slaty blue, the dorsal scales are alternately yellow and slate coloured, the yellow extending for about 10 or 12 scales and reappearing again after a somewhat longer interval; the scales on the sides of the yellow dorsal scales also exhibit conspicuous pale edgings so that the whole snake has the appearance of about 12 light coloured bands encircling the body.

*BUNGARUS BUNGAROIDES*, (Cantor), Boulenger, p. 389.

An example of this snake from Darjeeling presented by Mr. J. Gammon has a well marked loreal shield present on either side of the head.

*BUNGARUS LIVIDUS*, Cantor, Boulenger, p. 389.

The range of this species extends as far as Lower Bengal as is shown by an example procured at Saidpur in the Dinajpur district presented by Mr. W. de W. Peal.

The vertical scales of this snake are said by Mr. Boulenger to be "but feebly enlarged and not broader than long," in two, however, out of the three examples of this species in the Museum, the vertebral scales are certainly broader than long in the posterior part of the body.

*NAIA TRIPUDIANS*, Merr., Boulenger, p. 391.

There are in the Indian Museum a very large number of Cobras from different parts of India, and it seemed worth while to try and make out how far the various colour varieties of the Cobra were constant to fixed geographical areas.

The specimens in the Museum are all spirit-preserved ones and not very large, and although a great deal more has still to be done before an accurate knowledge of the geographical distribution of the varieties can be made out, the following seems to roughly indicate the truth.

a. Hood with the well known spectacle-marking on it; above and below, stone coloured, with the characteristic dark pectoral band across the chest.

In the Indian Museum examples from Banda, N.-W. P., Ganjam district, Calcutta, and the Krishnagar district.

This is "var. a" of Günther's Reptiles and the "Gokurrah" of Fayrer, and is probably found throughout the peninsula of India.

b. Hood with a white circular marking, edged with black, behind the hood-marking is a dark, followed by a light ring encircling the body, rest of the body dark, mottled lighter.

In the Indian Museum examples from Calcutta only where it ap-

pears to be the commonest variety, this is the "Keautiah" of Fayrer and "var.  $\theta$ " of Günther who also records it from Assam and Sikkim.

c. Hood as above with the circular marking; uniform brown above, below, anteriorly light coloured, posteriorly darker.

In the Indian Museum examples from Assansole, Bengal, Calcutta, Sibsaigar and Samagooting, Assam, Chittagong and the Andamans.

This is the variety most commonly met with, I believe, throughout Burma, it appears to correspond to "var.  $\zeta$ " of Günther which he records from Siam.

d. Hood with no marking, light coloured above and below with darker pectoral bands.

The Indian Museum contains examples of this species from the Rungpur district in Bengal, from Assam, the Chittagong hills, Mandalay and Mergui.

e. Hood with no marking, blue black above and below except slight traces of lighter colour on each side of the throat.

The Indian Museum contains examples of this well-marked variety from the Andamans (?) and Singapore, where it appears to be very abundant.

It seems to correspond to part of "var.  $\epsilon$ " of Günther.

f. No marking on the hood; very dark brown, almost black above and below.

The Indian Museum contains examples of this variety from the Punjab and Rajputana, and this is probably the same as part of Günther's "var.  $\epsilon$ " which came from the Deccan.

g. No marking on the head, colour a light sandy with bluish tinge; two dark bands on the neck extending all round, behind these two anterior bands a series of chevron-shaped forwardly directed bands, which become fainter towards the tail.

There are examples of this curiously coloured variety in the Indian Museum from Khojak in British Baluchistan and from the Punjab.

This variety was first described by Eichwald as *Tomyrus oxiana* and has been shown by Boulenger and Boettger to be conspecific with the typical *N. tripudians*.

*DISTIRA CYANOCINCTA*, (Daud.), Boulenger, p. 410.

The types of *Hydrophis trachyceps*, Theobald, (Cat. Rept. As. Soc. Mus. p. 70) and *Hydrophis crassicollis*, (Anderson, J. A. S. B. xi, p. 19) may both be referred to this species, the former was got at Mergui, the latter in the Hooghly below Calcutta.

*AMBLYCEPHALUS MONTICOLA*, (Cantor), Boulenger, p. 415.

There is a snake in the Indian Museum from Camorta in the Nico-

bars presented by Mr. F. A. de Roepstorff which seems quite identical with undoubted examples of *A. monticola* from Assam.

*AMBLYCEPHALUS MACULARIUS*, (Blyth ?), Boulenger, p. 416.

*AMBLYCEPHALUS CARINATUS*, (Reinw.), Günther, Reptiles Brit. Ind., p. 326.

A good deal of confusion in the synonymy of these snakes has been caused by Mr. Theobald, who when examining and cataloguing the Asiatic Society's collection of Snakes identified as the adult and young of the same species certain snakes which had been referred by Blyth to two different species, i. e., *Aplopeltura boa*, Schleg. (Theobald's adult) and *Pareas macularius*, Blyth (Theobald's young).

I have been quite unable to find any published description by Blyth of the latter species and so I must conclude that *Pareas macularius* is a manuscript name.

These snakes which were five in number Theobald first of all (J. Linn. Soc. x, p. 54), referred to *Pareas macularius*, the manuscript name given by Blyth to the three smaller specimens only; afterward (Cat. Rept. Mus. As. Soc., p. 63) he gave a new name, *Pareas berdmorei*, to these same five snakes, and finally (Cat. Rept. Brit. Ind., p. 203) he identified them with *Pareas margaritophorus*, Jan.

On examining the five snakes in question, it was at once evident that the two larger examples were quite distinct from the three smaller ones in colour and disposition of the head-shields and in fact in every way.

The larger snakes have internasals nearly as large as the prefrontals which latter shields are excluded from the eye, and in every other respect resemble *A. carinatus*; while the smaller snakes in which the prefrontal enters the eye, agree with the description of *A. macularius* as given in Boulenger's Reptiles.

*Pareas berdmorei* is therefore only in part a synonym of *Amblycephalus macularius* as described by Boulenger, and also in part a synonym of *Amblycephalus carinatus*.

There are in the Indian Museum only the three original specimens of *A. macularius*, which were procured by Major Berdmore at Martaban in Burma; of the other species, *A. carinatus*, which is an addition to the Fauna of the Indian Empire, besides the two specimens procured by Major Berdmore in Tenasserim, there are two from Tavoy (Museum Collector), one from the Burma-Siam hills and one from Mergui (Anderson).

*TRIMERESURUS GRAMINEUS*, (Shaw), Boulenger, p. 429.

*TRIMERESURUS PURPUREOMACULATUS*, (Gray), Boulenger, p. 429.

Of these two species there is a very large series in the Museum; and if the insular and Malayan forms be excluded, the two species are fairly

constant in scaling and colour. The points of distinction between the two species are as follows :

In *T. purpureomaculatus* the head scales are juxtaposed and convex or keeled, the temporal scales are strongly keeled, the scales are in 25-27 rows and the colour is in spirit a porphyraceous blue; in *T. gramineus* the head scales are small, smooth, and imbricate, the temporal scales are also smooth, the scales are in 19 to 23 rows and the colour is a uniform green.

It is in most cases perfectly easy to distinguish these two snakes, but there are in the Indian Museum some specimens which are intermediate in character, whether they are hybrids or not it is difficult to say, but as the two snakes inhabit approximately the same geographical area, it is quite possible that this may be the case.

Among the intermediate forms may be mentioned nine snakes from Sibsaigar in Assam (register no. 4015-23) which have the juxtaposed convex head shields of *T. purpureomaculatus*, but the smooth temporals and 21 rows of scales of *T. gramineus*; again a snake (register no. 4109) from Moulmein has the convex head shields and keeled temporals but only twenty-one rows of scales.

Of *T. purpureomaculatus* the Museum contains examples from Lower Bengal, and from various localities in Assam and Burma; and of *T. gramineus*, examples from Simla, Sikkim, Assam, Burma and Hongkong.

In the Islands of the Bay of Bengal, Prepara Island, Cocos Isles, the Andamans and Nicobars there are several different coloured varieties of Pit vipers which, in my opinion with one exception only, are better referred to *Tr. gramineus* than to *Tr. purpureomaculatus*; besides these varieties there is a closely allied form, which is recognised by Boulenger as a separate and distinct species; this is *Tr. cantoris* of Blyth, of which the Museum possesses a fair series, all from the Nicobars with one exception, which is from the Andamans.

The following is a list with brief descriptions of the various varieties above mentioned.

a. Prepara Island variety.

Light brown above with darker dorsal and lateral spots; ventrals light coloured, marbled with brown, scales in 25 rows; this form has the characteristic juxtaposed convex head scales and keeled temporals, and I have considered it to be an insular variety of *T. purpureomaculatus*.

b. Mottled variety.

Brown above blotched with blue, below bluish with brown blotches, scales in 23-25 rows, head scales as in *T. gramineus*. In the Indian Museum there are a good number of snakes of this variety from the Andaman Islands alone.

## c. Brown variety.

This resembles the last, but there is little or no trace of the blue mottling on the ventrals which are almost uniform brown. Two examples from the Andamans in the Indian Museum.

## d. Uniform or banded variety.

Colour uniform light reddish or dusky or with regular white transverse bands; scales in 21 rows.

This is the variety described by Stoliczka under the name of *T. mutabilis*, and is found on both the Andamans and Nicobars.

e. Green above, lighter below, resembling the typical variety found in Assam and Burma, scales in 21-25 rows.

This variety occurs on the Andamans, Cocos and Nicobars.

All the above varieties with the exception of the first seem to be referable to *T. gramineus* rather than to *T. purpureomaculatus*.

## EXPLANATION OF PLATE VI.

- Fig. 1. *Ablabes stoliczkae*, sp. nov. × 2.
2. *Simotes woodmasoni*, sp. nov.
3. *Zaocys tenasserimensis*, sp. nov.
4. *Tropidonotus pealii*, sp. nov.
5. *Tropidonotus nicobaricus*, sp. nov. × 2.

XI.—*Catalogue of the Diptera of the Oriental region by* MONS. J. M. F. BIGOT. PART I. *Communicated by the* SUPERINTENDENT OF THE INDIAN MUSEUM.\*

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## Order DIPTERA.

## Suborder HOMALOCERATI.

J. Bigot, *adhuc ined.*

## Division NEMATOCERATÆ.

J. Bigot, *adhuc ined.*: Nematocera, Meigen, *Syst. Besch.*, i, 1818.

## Family CULICIDÆ.

J. Bigot, *adhuc ined.*: Culiciformes, Meigen *Syst Besch.* i, 1818: Culicidæ, Latr. *Fam. Natur.* 1825: Macquart, *S. & Buff. Dipt.* i, 1834: Culicinæ, Zetterst., *Ins. Japonica*: Culicinæ Rondani, *Prodr.* i, 1856: Culicina, Schiner, *Faun. Austr. Fliegen* 1864.

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\* This Catalogue was drawn up by M. Bigot at the suggestion of the late Mr. Atkinson and was to have formed part of the series of Catalogues of the Insects of the Oriental Region, which have been discontinued since Mr. Atkinson's death.

Genus ANOPHELES.

Meigen, *Syst. Besch.* i, 1818, p. 10: *Culex*, pt., Linn.

*annularis*, V. der Wulp, *Notes Leyden Mus.*, vi, 1884, p. 249.

Hab. Java.

*barbirostris*, id. *ibid.*, p. 248.

Hab. Java.

*sinensis*, Wiedem., *Auss. Europ. Zweifl. Ins. Hamm.* 1828, i, p. 47.

Hab. China.

Genus MEGARHINUS.

Rob.-Desvoidy, (*alias Megarhina*) *Essai sur les Tipul.*: *Culex*, pt.

*splendens*, (*Culex*) Wiedem., *Zool. Magaz.* iii, p. 2.

Hab. Java.

Genus CULEX.

Linn., *Faun. Suec.* 1761: Meigen, *Illig. Magaz.* ii, p. 260, (auct.).

*laniger*, Wiedem., *Auss. Europ. Zweifl. Ins. Hamm.* 1828, p. 5.

Hab. Java.

*fuscus*, id. *ibid.*, p. 6.

Hab. India.

*fatigans*, id. *ibid.*, p. 10.

Hab. India.

*molestus*, id. *ibid.*, p. 542.

Hab. Sumatra.

*sitiens*, id. *ibid.*, p. 543.

Hab. Sumatra.

*vagens*, id. *ibid.*, p. 545.

Hab. China.

*amboinensis*, (*Melius Megarhina*) Doleschall *Natuur. Tijdschr. Nederl. Indië.* xiv, 1857, p. 381.

Hab. Amboina.

*aureostriatus*, id. *ibid.*, p. 385.

Hab. Amboina.

*cingulatus*, id. *Natuur. Tijdschr. Nederl. Indië, Batavia.* x, 1856, p. 405.

Hab. Java.

*subulifer*, id. *ibid.*, xiv, 1857, p. 382.

Hab. Amboina.

*nero*, id. *ibid.*, xiv, 1857, p. 383.

Hab. Java.

*setulosus*, id. *ibid.*, xiv, 1857, p. 384.

Hab. Java.

*luridus*, id. *ibid.*, xiv, 1857, p. 384.

Hab. Java.

*variegatus*, id. *ibid.*, xvii, 1858, p. 77.

Hab. Amboina.

*annulipes*, Walker, *Journ. Proceed. Linn. Soc. London*, i, 1857, p. 6.

Hab. Singapore.

*imprimens*, id. *ibid.*, v, 1861, p. 144.

Hab. Amboina.

*ventralis*, id. *ibid.*, v, 1861, p. 144.

Hab. Amboina.

*dives*, Schiner *Novara Reise* 1868, p. 31.

Hab. Batavia.

*longipalpis*, V. der Wulp, *Tijdschr. Ent.* xxii, blz. lxxvii, p. 9.

Hab. Sumatra.

*crassipes*, id. *ibid.*, p. 9.

Hab. Sumatra.

#### Family CHIRONOMYDI.

J. Bigot, *adhuc ined.*: Chironomydæ, Schiner *Faun. Austr. Flieg.*, ii, 1864, p. 574: Chironomides Westw., *Introd. Entom.* 1840: Tipul. Culiciform Macquart. *S. à Buff. Dipt.* i, 1834: Chironomides, Macquart, *Dipt. Esot.*, 1838, p. 36.

#### Genus CERATOPOGON.

Meigen, *Illig. Magaz.* ii, 1803, p. 261: *Culex* pt. Linn.: Chironomus pt. Fabr., Fallen: Culicoides, Latr.; Palpomyda, Prionomyda, Ceratopogon pt., Rossi.

*trichopus*, Thomson, *Eugenie Resa*, 1868, p. 444.

Hab. China.

*agas*, Rondani, *Ann. Mus. Civ. Genova*, vii, 1875, p. 462.

Hab. Borneo.

#### Genus CHIRONOMUS.

Meigen, *Illig. Magaz.* ii, 1803, p. 260; *Thalassomyia*, pt. Schiner: *Tipula*, pt. Linn.

*venustus*, Wiedem., *Auss. Europ. Zweifl. Ins. Hamm.* 1828, i, p. 547.

Hab. China.

*vicarius*, Walker, *Ins. Saunders. Dipt. London*, 1856, p. 423.

Hab. India.

*subiculorum*, Doleschall, *Natuur. Tijdschr. Nederl. Indie, Batavia*, x, 1856, p. 405.

Hab. Java.

*pictus*, id. *ibid.*, xiv, 1857, p. 386.

Hab. Java.

*socius*, Walker, *List Dipt. Ins. Brit. Museum London*, 1848, pt. 1, p. 16.

Hab. India.

#### Genus TANYPUS.

Meigen, *Illig. Magaz.* ii, 1803, p. 261 : *Tipula* pt. Linn., Degeer : *Chironomus* pt. Fabr.

*pardalis*, Doleschall, *Naturk. Tijdschr. Nederl. Indie, Batavia*, v, 1856, p. 405.

Hab. Java.

*melanurus*, id. *ibid.*, p. 405.

Hab. Java.

*cyanomaculatus*, id. *ibid.*, p. 406.

Hab. Java.

*nigrocinctus*, id. *ibid.*, p. 406.

Hab. Java.

*ornatus*, id. *ibid.*, xiv, 1857, p. 385.

Hab. Java.

*crux*, Wiedem. *Anal. Entom.* 10, id., *Ausser Europ. Zweifl. Ins.* i, Hamm, 1828, p. 10.

Hab. India.

#### Genus MACROPEZA.

Meigen, *Syst., Besch.*, i, 1818, p. 87 : Wiedem., Macq., Walker, Schiner, Rondani, (et auct.).

*gibbosa*, Wiedem., *Ausser Europ. Zweifl. Ins. pt. i, Hamm.* 1828, p. 20.

Hab. India.

#### Family CECIDOMYDI.

Bigot, *adhuc ined.* 1891 : *Tipulariae Gallicoloe*, Gallmücken, Meigen, *Syst. Besch.* 1818, i, p. xxxiv : *Cecidomyida*, Westw. *Introduct. Entom.* 1840 : *Cecidomyidae*, Schiner, *Faun. Austr. Fliegen*, ii, Wien, 1864, p. xviii.

#### Genus CECIDOMYIA.

Meigen, *Illig. Magaz.* ii, 1803, p. 261, Latr., Wiedem., Macq., Schiner, Rondani, V. de Wulp, Walker, (et auct.) : *Tipula*, pt. Degeer : *Dasyneura* pt. Rondani : *Oligotrophus*, pt. Latr.



*deferenda*, Walker, *Journ. Proceed. Linn. Soc. London*, i, 1857, p. 105.

Hab. Sarawak.

*oryzæ*, Wood-Mason, *Indian Museum Notes*, i, p. 103, pl. vi, fig. 6,

Hab. Bengal.

#### Genus LASIOPTERA.

Meigen, *Syst. Besch.* i, p. 88, 1818: *Cecidomyia* pt. Meigen: *Tipula* pt.  
Linn., Degeor.

*bryonicæ*, Schiner, *Novara Reise* 1868, p. 5.

Hab. Madras.

#### Family DIXADI.

Bigot, *adhuc ined.* 1891.

#### Genus DIXA.

Meigen, *Syst. Besch.* i, 1818, p. 216.

*guttipennis*, Thomson, *Eugenie Resa* 1863 p. 448.

Hab. China.

#### Family TIPULIDI.

*Tipulidæ*, Leach, in *Sam. Comp.* 1819: *Tipulidæ*, Schiner, *Faun. Austr. Fliegen* ii, 1864, p. 495: *Tipulariæ*, Latr. *Hist. Nat. Ins.* 1802: *Tipulari-*  
*des*, Leach *Edinb. Encycl.* 1815: *Tipulides*, Westw. *Introd. Mod. Class. Insects*, 1840.

#### Genus CTENOPHORA.

Meigen, *Illig. Magaz.* ii, 1803, p. 263: Wiedem., Macq., Schiner, Zetterst.,  
Rondani, Ost.-Sacken pt.: *Pselliophora*, pt. Ost.-Sacken. *Berlin Ent. Zeitschr.* 1886, xxxi. p. 168: *Tanyptera*, Latr.: *Dictenidia* et *Xyphura*,  
pt. Brullé.: *Ceroctena* et *Xyphura* pt. Rondani.

*melanura*, Walker, *List Dipt. Ins. Brit. Museum London*, i, 1848, p. 78. c

Hab. Nepal.

*xanthomelana*, id. *ibid.*, p. 77.

Hab. India.

*melanura*, id. *ibid.*, p. 78.

Hab. Nepal.

#### Genus PSELLIOPHORA.

Ost-Sacken, *Berlin Entom. Zeitschr* 1886, xxx, p. 168: *Ctenophora* pt. Meigen

*læta* (*Ctenophora*) Wiedem., *Ausser. Europ. Zweifl. Ins.* i, p. 40: (*Tipula* id. Fabr.)

Hab. India.

*ardens*, (*Ctenophora*), id. *ibid.*, p. 89.

Hab. Java.

*compedita*, (*Ctenophora*) id. *ibid.*, p. 39.

Hab. Java.

*taprobanes*, (*Ctenophora*) Walker *List. Dipt. Ins. Brit. Mus. London*, 1848, i, p. 77.

Hab. Ceylon.

*fumiplena*, (*Ctenophora*) Walker *Ins. Saunders. Dipt. i, London*, 1856, p. 449.

Hab. China.

*javanica*, (*Ctenophora*) Doleschall, *Natuurk. Tijdsch. Nederl. Indie, Batavia*, x, 1856, p. 406.

Hab. Borneo, Java.

*chrysophila*, (*Ctenophora*) Walker *Journ. Proceed. Linn. Soc. Lond.* i, 1857, p. 6.

Hab. Singapore.

*curvipes*, (*Ctenophora*) V. der Wulp, *Notes Leyden Mus.* vi, 1884, p. 254.

Hab. Gorontalo, Java?

*annulosa*, (*Ctenophora*) id. *ibid.*, vii, p. 1.

Hab. Java.

*rubra*, Ost.-Sacken, *Berlin. Entom. Zeitschr.* xxx, 1886, p. 171.

Hab. Laos.

#### Genus PRIONOTA.

V. de Wulp, *Notes Leyd. Mus.* vii, 1885 p. 1.

*nigriceps*, V. der Wulp, id. *ibid.*, p. 2.

Hab. Java.

#### Genus OLIGOMERA.

Doleschall, *Natuurk. Tijdschr. Nederl. Indie, Batavia* xiv, 1857, p. 387,

*Eriocera*, pt. Maquart.

*javensis*, Doleschall, *ibid.*, p. 387: *Eriocera acrostacta*, V. der Wulp.

Hab. Java.

#### Genus PACHYRHINA.

Macquart, *S. à Buff. Dipt.* i, 1834, p. 88: *Tipula* pt.: *Nephrotoma*, pt.

Olivier, *Encycl. Method.*

*bombayensis*, Macquart *Dipt. Exot. Paris*, 1855, 5th *Suppl.* p. 15.

Hab. Bombay.

*delecta*, Walker, *Ins. Saunders. Dipt. Lond.* 1856, p. 445, *Tipula* id. Macq.

Hab. India.

*quadrivittata*, V. der Wulp, *Notes Leyden Mus.* vi, 1885, p. 9.

Hab. Java.

*triplassia*, id. *ibid.*, p. 10.

Hab. Java.

*fasciata*, Macquart, *S. à Buff. Dipt.*, i, Paris, 1834, p. 90.

Hab. Java.

*doleschalli*, (*Nomen Novum*), *Tipula javensis*, *Doleschall Natuur. Tijdschr. Nederl. Indie, Batavia*, x, 1856, p. 406: *Ost.-Sacken, Ann. Mus. Civ. Genova*, xvi, 1881, p. 399: *P. fasciata*? Macq. (*Vid. Suppl.*).

Hab. Java.

### Genus TIPULA.

Linn., *Faun. Suec.* 1761, p. 430 (et auct).

*praepotens*, Wiedem., *Auss. Europ. Zweifl. Ins.* i, Hamm, 1828, p. 40.

Hab. Java.

*monochroa*, id. *ibid.*, p. 41.

Hab. Java.

*pedata*, Wiedem., *Dipt. Exot.* i, p. 23.

Hab. Java.

*umbrina*, Wiedem., *Auss. Europ. Zweifl. Ins.* i, Hamm, 1828, p. 49: *T. congrua*, Walker.

Hab. Java.

*javana*, id. *Dipt. Exot.* i, 1821, p. 27.

Hab. Java.

*castanea*, Macq. *Dipt. Exot.* i, 1838, p. 54.

Hab. Java.

*venusta*, Walker, *List Dipt. Ins. British Museum*, i, 1848, p. 64.

Hab. Sylhet.

*fulvipennis*, id. *ibid.*, p. 67.

Hab. Nepal.

*reposita*, id. *ibid.*, p. 67.

Hab. Nepal.

*melanomera*, id. *ibid.*, p. 68.

Hab. Nepal.

*nova*, id. *ibid.*, p. 71.

Hab. Hong-Kong.

*vicaria*, id. *Ins. Saunders. Dipt. Lond.* 1856, pt. i. p. 445.

Hab. India.

*javensis*, *Doleschall, Natuur. Tijdschr. Nederl. Indie, Batavia*, x, 1856, p. 406.

Hab. Java.

*longicornis*, id. *ibid.* xvii, 1858, p. 79.

Hab. Amboina.

*vilis*, Walker, *Journ. Proceed. Linn. Soc. London*, i, 1857, p. 108.

Hab. Borneo.

*fumifinis*, id. *ibid.*, v, 1861, p. 145.

Hab. Amboina.

*serrata*, V. der Wulp, *Notes Leyden Mus.* vii, 1885, p. 5.

Hab. Serahan?

*pilosula*, id. *ibid.*, p. 5.

Hab. Java.

*leucopyga*, id. *ibid.*, p. 6.

Hab. Java.

*brobdignagia*, Westwood, *Trans. Ent. Soc. Lond.* 1876, p. 504.

Hab. N. China.

### Genus CONOSIA.

V. der Wulp, *Tijdschr. Entom.* 1880, p. 159 : *Limnobia*, pt. Wiedem.

*irrorata*, V. der Wulp, *loc. cit.* p. 161 : *Limnobia* id. Wiedem. *Ausser Europ. Zweifl.*

*Ins.* i, *Hamm*, 1828, p. 574.

Hab. Java.

*crux*, id. *ibid.*, p. 161 : (*Limnophila*) Doleschall, *Natuur. Tijdschr. Nederl. Indie*, *Batavia*, xiv, 1858, p. 388.

Hab. Java.

### Genus LIMNOPHILA.

Macquart, *S. d. Buff. Dipt.* i, 1834, 95 : *Limnobia* pt. Meigen (et auctor).  
*Limnomyia*, Rondani *Prodr.* 1861, vi, p. 11.

*basilaris*, Macquart, *Dipt. Esot.* i, *Paris*, 1838, p. 66 : *Limnobia* id. Wiedem. *Auss.*  
*Europ. Zweifl.* *Ins.* i, *Hamm*, 1828, p. 27.

Hab. Java.

*bicolor*, id. *ibid.*, p. 66 : *Eriocera* id. Ost.-Sacken.

Hab. Bengal.

### Genus ERIOCERA.

Macquart, *Dipt. Esot.* pt. v, *Paris*, 1838, p. 74, *Pterocosmus* pt. Walker :  
*Allarithmia*, Loew, *Bernst. Faun.* 1850, p. 38 : *Physocrania*? pt. Bigot,  
*Ann. Soc. Ent. France*, (3) vii, 1859, p. 123 : *Arrhenica*, pt. Ost.-  
Sacken, *Proceed. Acad. N. Sci. Philadelphia* 1859, p. 243.

*selene*, Ost.-Sacken *Ann. Mus. Civ. Genova*, xvi, 1881, p. 406.

Hab. Sumatra.

*humberti*, Ost.-Saaken, *Berlin. Ent. Zeitschr.*, xxxi, 1887, p. 221.

Hab. Ceylon.

*melesgris*, id. *ibid.*, p. 222.

Hab. Ceylon.

*pachyrrhina*, id. *ibid.*, p. 222.

Hab. Ceylon.

*crystalloptera*, id. *ibid.*, p. 222.

Hab. Ceylon.

*albonotata*, id. *ibid.*, p. 223 : *Limnobia*, id. Loew, *Peter's Reise*, p. 1.

Hab. Ceylon.

*acrostacta*, V. der Wulp, *Notes Leyden Mus.* vi, 1884 p. 11 : *Limnobia*, id. Wiedem.

*Dipt. Exot.* p. 1 : *Cylindrotoma*, id. Macquart, *Dipt. Exot.*, i, p. 168, *Suppl.* iii,

p. 7 : *Oligoneura javensis*, Doleschall.

Hab. Java.

*albipunctata*, V. der Wulp, *Tijdschr. Entom.* xxiii, p. 158.

Hab. Java.

*ferruginosa*, id. *Notes Leyden Mus.* vii, 1885, p. 13.

Hab. Java.

*lunata*, Westwood, *Trans. Ent. Soc. London*, 1881, pt. iii, p. 367.

Hab. Sarawak.

### Genus PTEROCOSMUS.

Walker, *List Dipt. Ins. Brit. Mus.* pt. 1, *Lond.* 1848, p. 78 : *Eriocera*, pt.

V der Wulp.

*velutinus*, Walker, *loc. cit.* p. 79.

Hab. Nepal.

*hilpa*, id. *ibid.*, p. 79 : *Eriocera* id., V. der Wulp, *Notes Leyden Mus.* vii, 1885 p. 12.

Hab. Hong-kong.

*lunigerus*, Walker, *Journ. Proceed. Linn. Soc. London*, i, 1857, p. 107. <sup>c</sup>

Hab. Borneo.

*infixus*, id. *ibid.*, p. 107.

Hab. Borneo.

*optabilis*, id. *ibid.*, p. 107.

Hab. Borneo.

*combinatus*, id. *ibid.*, p. 107.

Hab. Borneo.

*dilutus*, id. *ibid.*, p. 108.

Hab. Borneo.

Genus LIMNOBIA.

Meigen, *Syst. Besch.* 1818, p. 116: Tipula, pt. Linn., Fabr.: Limonia,  
Meigen, *Illig. Magaz.*, 1803: Dicranomyia, pt. et Limnobia, pt. Ost.-  
Sacken: Limnomyza, Rondani, *Prodr.* i, 1856: Glochina, pt. Meigen,  
Staecker.

diana, Macq., *S. d. Buff. Dipt. Paris*, 1834, p. 107.  
Hab. Bengal.

sorbillans, Wiedem., *Auss. Europ. Zweifl. Ins. Hamm*, 1828, p. 551.  
Hab. Sumatra.

trentepohlii, id. *ibid.*, p. 551.  
Hab. Sumatra.

apicalis, id. *ibid.*, p. 551.  
Hab. Sumatra.

bibula, id. *ibid.*, p. 552.  
Hab. China.

mesopyrrha, id. *ibid.*, p. 26.  
Hab. Java.

costalis, id. *ibid.*, p. 37.  
Hab. India.

sumatrensis, Macquart, *Dipt. Exot. Paris, Suppl.*, iv, 1850, p. 16.  
Hab. Sumatra.

aterrima, Walker, *Ins. Saunders, Dipt. London*, 1856, p. 434.  
Hab. India.

substituta, id., *List Dipt. Ins. Brit. Mus. London*, i, 1848, p. 39.  
Hab. China.

sanguinea, Doleschall, *Natuur. Tijdschr. Nederl. Indie*, xiv, Batavia, 1857, p. 391.  
Hab. Java.

impressa, Walker, *Journ. Proceed. Linn. Soc. London*, i, 1857, p. 106.  
Hab. Borneo.

rubescens, id. *ibid.*, p. 106.  
Hab. Borneo.

pyrrhochroma, id. *ibid.*, p. 106.  
Hab. Borneo.

argentocincta, id. *ibid.*, p. 107.  
Hab. Borneo.

leucotelus, id. *ibid.*, p. 6.  
Hab. Singapore.

*plecioides*, id. *ibid.*, p. 6.

Hab. Singapore.

*vittifrons*, id. *ibid.*, v, 1861, p. 144.

Hab. Amboina.

### Genus CYLINDROTOMA.

Macquart, *S. à Buff. Dipt. Paris*, 1834, p. 107 : *Limnobia*, pt. (auctor.)

*albitarsis*, Doleschall, *Naturk. Tijdschr. Nederl. Indie* xiv, *Batavia*, 1857, p. 391.

Hab. Java.

### Genus PÆCILOSTOLA.

Loew, *Wien. Entom. Monatschr.*, vii, 1863, p. 222.

*pallens*, V. der Wulp, *Notes Leyden Mus.* vii, 1885, p. 13.

Hab. Java.

### Genus TANYDERUS.

Philippi, *Verh. K. K. Z. B. Gesellsch. Wien*, 1865, p. 780.

*ornatissimus*, Ost.-Sacken, *Berlin. Ent. Zeitschr.* xxxi, 1887, p. 228 : *Cylindrotoma*

id., Doleschall, *Natuur. Tijdschr. Nederl. Indie*, xvii, *Batavia*, 1858, p. 80.

Hab. Amboina.

### Genus MEGISTOCERA.

Wiedem., *Auss. Europ. Zweifl. Ins.* i, *Hamm*, 1828, p. 55 : *Nematocera*, olim

Wiedem., *Dipt. Esot.* i, 1821, p. 29 : Macquart, Schiner, Ost.-Sacken,  
etc.

*fuscana*, Wiedem. *loc. cit.* p. 55 : *Nematocera*, id., Wiedem., *Dipt. Esot.* i, 1821.

Hab. Java.

*verticalis*, id. *ibid.*, p. 56.

Hab. Java

*atra*, Doleschall, *Naturk. Tijdschr. Nederl. Indie*, xvii, *Batavia*, 1858, p. 80.

Hab. Amboina.

### Genus TRICHOCERA.

Meigen, *Illig. Magas.* ii, 1803, p. 262 : *Tipula*, pt. (auctor.) : *Limonia*,

Latr., Macq., Walker, Schiner, Rondani, Ost.-Sacken, etc.

*ocellata*, Walker, *Ins. Saunders. Dipt. London*, 1856, p. 433.

Hab. India.

Genus DICRANOMYIA.

Stephens *Catal. Brit. Ins.* 1829.

*saltens*, Ost.-Sacken, *Berlin. Ent. Zeitschr.* **xxi**, 1887, p. 172: *Limnobia* id.  
*Doleschall, Naturk. Tijdschr. Nederl. Indie*, **xiv**, *Batavia*, 1857, p. 390.  
 Hab. Java.

Genus LIDNOTES.

Westwood, *Trans. Ent. Soc. London*, 1876, p. 505.

*thwaitesiana*, Westw. *loc. cit.* p. 505.  
 Hab. Ceylon.

Genus MONGOMA.

Westwood, *Trans. Ent. Soc. London*, 1881, p. 364.

*simplex*, Ost.-Sacken, *Ann. Mus. Civ. Genova*, **xvi**, 1881, p. 402.  
 Hab. Ternate.

*pœcilloptera*, id. *ibid.*, p. 403.  
 Hab. Sumatra.

*aurantiaca*, id. *Berlin. Ent. Zeitschr.* **xxi**, 1887, p. 181: *Limnobia* id. *Doleschall*,  
*Naturk. Tijdschr. Nederl. Indie, Batavia*, **xvii**, 1859, p. 78.  
 Hab. Java.

Genus TEUCHOLABIS.

Osten-Sacken, *Proceed. Acad. Nat. Sci. Philadelphia*, 1859, p. 222.

*bicolor*, Ost.-Sacken, *Ann. Mus. Civ. Genova*, **xvi**, 1881, p. 404.  
 Hab. Sumatra.

*fenestrata*, id. *Berlin. Ent. Zeitschr.* **xxi**, 1887, p. 188.  
 Hab. Ceylon.

*determinata*, id. *ibid.*, p. 188.  
 Hab. Sula.

Family MYCETOPHILIDI.

J. Bigot, *adhuc ined.* 1891: *Mycetophilidæ*, Schiner, *Faun. Austr. Dipt.* **ii**,  
*Wien*, 1864, p. 416: *Mycetophilides*, Westwood, *Introd. Modern Class.*  
*Ins.* 1840: *Tipul. Fungicolæ*, Latr.: *Tipul. Fungivoræ*, Meigen.

Genus MYCETOPHILA.

Meigen, *Illig. Magaz.* **ii**, 1803, p. 263? *Sciara* pt. Fabr.

*bimaculata*, Walker, *List Dipt. Ins. Brit. Museum*, **i**, *London*, 1848, p. 100.  
 Hab. India.



*pennipes*, Osten-Sacken, *Berlin. Entom. Zeitschr.* xxxi, 1887, p. 204.  
Hab. Borneo.

#### Genus PLATYURA.

Meigen, *Illig. Magaz.* ii, 1803, p. 264 : *Sciophila*, pt. Meigen : *Sciara*, pt.  
Fabr. : *Ceroplatus*, pt. Fabr., Latr. : *Asindulum*, pt. Latr.

*aenusta*, Walker, *Ins. Saunders. Dipt.* i, London, 1856, p. 421.  
Hab. India.

#### Genus GLAPHYROPTERA.

Winnertz, *Verhandl. K. K. s. b. Gesellsch. Wien*, xiii, 1863, p. 781 : *Leia* pt.  
*winthemi*, Lehmann, V. der Wulp, *Reisen in Midden Sumatra* iv, *Natuurlijke*  
*Histoire, Diptera*, p. 7.  
Hab. Sumatra. Borneo ?

#### Genus SCIOPHILA.

Meigen, *Syst. Besch.* i, 1818, p. 245 : *Platyura*, pt. Fabr., Meig. : *Asindu-*  
*lum*, pt. Latr.  
*tropica*, Doleschall, *Naturk. Tijdschr. Nederl. Indie*, xiv, *Batavia*, 1857, p. 392.  
Hab. Java.

#### Genus SCIARA.

Meigen, *Illig. Magaz.* ii, 1803, p. 263 : *Tipula*, pt. Linn., Fabr. : *Hirtea*,  
Fabr. : *Molobrus*, Latr. : *Planetes*, pt. Walker : *Planetella*, pt. Westwood.  
*femoralis*, Doleschall, *Naturk. Tijdschr. Nederl. Indie*, xvii, *Batavia*, 1858, p. 78.  
Hab. Amboina.  
*indica*, Walker, *Ins. Saunders. Dipt.* i, London, 1856, p. 418.  
Hab. India.  
*laticornis*, id. *Journ. Proceed. Linn. Soc. London*, i, 1857, p. 105.  
Hab. Borneo.  
*solita*, id. *ibid.*, p. 105.  
Hab. Borneo.  
*rufithorax*, V. der Wulp, *Reisen in Midden Sumatra*, iv, *Natuurlijke Histoire, Dip-*  
*tera*, p. 7.  
Hab. Sumatra.  
*thomae*, id. *ibid.*, p. 7.  
Hab. Sumatra.  
*sulcata*, id. *Tijdschr. Entom.* xxx, 1886-87, p. 177.  
Hab. Java.

Family RHYPHIDI.

J. Bigot, *adhuc in ed.* 1891: Rhyphidæ Schiner, *Faun. Austr. Flieg.* ii, Wien., 1864, p. xxiv.

Genus RHYPHUS.

Latr. *Diction.* iv, 1804: Tipula pt. Scopoli: Sciara, Rhagio, pt. Fabr.: Anisopus (*olim*) Meigen.

*maculipennis*, V. der Wulp, *Notes Leyden Mus.* vii, 1835, p. 14.

Hab. Java.

Family BIBIONIDI.

J. Bigot, *adhuc. med.* 1891: Bibionidæ, Schiner, *Faun. Austr. Flieg.*, 1864, p. xvi: Bibionides, Westwood, *Introd. Mod. Class. Ins.* 1840: Tipulariæ florales, Latr.: Tip. Muscæformes et Latipennes Moig.

Genus SCATHOPSE.

Geoffroy, *Hist. d. Ins.* ii, 1764, p. 545: Tipula pt. Linn., De Geer, Fabr.: Hirtea pt. Fabr. (Moig. *olim*): Ceria, Scopoli: Aspistes, Rath. pt.

*pusilla*, Doleschall, *Naturk. Tijdschr. Nederl. Indie*, x, Batavia, 1859, p. 407.

Hab. Java.

Genus PLECIA.

Wiedem., *Auss. Europ. Zweifl. Ins.* i, Hamm. 1828, p. 72: Crapitula, pt. Gimmerth. *Bull. Moscou*, 1845: Penthethria, pt. Moig. *Illig. Mayaz.* ii, 1803, p. 264.

*melanaspis*, Ost.-Sacken, *Ann. Mus. Civ. Genova*, xvi, 1881, p. 307: Penthethria, id.

Wiedem., *Auss. Europ. Zweifl. Ins.* 1828, i, p. 72: Penth. japonica, id. *ibid.*, p. 618: Plectia ignicollis, Walker, *Lust. Dipt. Ins. Brit. Mus. London*, 1848, p. 116.

Hab. Nepal.

*fulvicollis*, V. der Wulp, *Tijdschr. Entom.* xxiii, p. 156: Hirtea id. Fabr., *Syst.*

*Antl.* p. 53: Plectia id., Wiedem., *Auss. Europ. Zweifl. Ins.* p. 73: Penthethria id.

Wiedem. *Dipt. Exot.* i, p. 31: Plectia id. Macquart, *S. à Buff. Dipt.* i, p. 176: Plectia

id. Doleschall *Natuur. Tijdschr. Nederl. Indie*, x, Batavia, 1839, p. 407: Plectia, id.

Rondani, *Ann. Mus. Civ. Genova*, vii, p. 462: Plectia dorsalis, Walker, *Journ. Proceed. Linn. Soc. London*, i, 1857, p. 5.

Hab. Sumatra and Malay Peninsula.

*tergorata*, Rondani, *Ann. Mus. Civ. Genova* vii, 1875, p. 462.

Hab. Borneo.

*forcipata*, Ost.-Sacken *Ann. Mus. Civ. Genova*, xvi, 1881, p. 397.

Hab. Sumatra.

subvarians, Walker, *Journ. Proceed. Linn. Soc. London*, i, 1857, p. 105.

Hab. Sarawak.

tristis, V. der Wulp, *Notes Leyden Mus.* vi, 1884, p. 251.

Hab. Java.

### Genus BIBIO.

Geoffroy, *Hist. Ins.* ii, 1764, p. 571 : Tipula pt. De Geer, Linn., Schin.

' Hirtea, pt. Fabr., Panzer, Meig., (*olim*), Zetterst., etc.

bicolor, Walker, *List. Dipt. Ins. Brit. Mus.* pt. i, London, 1848, p. 121.

Hab. Indiz.

rubicundus, V. der Wulp, *Notes Leyden Mus.* vi, 1884, p. 251.

Hab. Java.

### Genus SIMULIUM.

Latreille, Buffon, *Hist. Nat. Crust. et Ins.* xiv, 1805, p. 294.

indicum, Becher *Journ. Asiat. Soc. Bengal*, liii, 1884, p. 199, pl. xiv.

Hab. Assam.

### Division BRACHYCERATÆ.

J. Bigot, *adhuc ined.* 1891.

### Sub-division EMPODIATA.

J. Bigot, *adhuc ined.* 1891.

### Family TABANIDI.

J. Bigot, *adhuc ined.* 1891 : Tabanii, Latr., 1802, Meigen, Macquart, Zetterst., Loew : Tabanidæ, Leach, 1819, Schiner, 1862 : Tabanides, Latr. 1829 : Tabanina, Tabaninus, Rondani, 1846 : Tabanidæ, Westwood, Walker : Tabanidii, J. Bigot (*olim*) : Anthracina, Rafinesque : Sclerostoma, Duméril : Tabanica, Burmeister : Tabanites, Newman.

### Genus CHRYSOPS.

Meigen, *Illig. Magaz.*, ii, 1803, p. 267 : Tabanus pt.

ligatus, Walker, *List. Dipt. Ins. Brit. Museum, Lond.*, i, 1848, p. 105.

Hab. Bengal.

*terminalis*, id. *ibid.*, p. 195.

Hab. India.

*semicirculus*, id. *ibid.*, p. 196.

Hab. India.

*stimulans*, id., *Ins. Saunders. Dipt. London*, i, 1856, p. 73.

Hab. India.

*pellucidus*, Fabr. *Syst. Antl.*, p. 113.

Hab. Tranquebar.

*dispar*, Fabr., *Entom. System. Suppl.*, p. 567.

Hab. India.

*fasciatus*, Wiedem., *Dipt. Exot.*, i, p. 103.

Hab. Java.

*translucens*, Macquart, *Dipt. Exot.* pt. i, 1838, p. 158.

Hab. Java.

*flaviventris*, id. *ibid.*, *Suppl.* i, 1846, p. 44.

Hab. India.

*ruftarsis*, id. *ibid.*, *Suppl.*, ii, 1847, p. 14.

Hab. Java.

*fixissimus*, Walker, *Journ. Proceed. Linn. Soc. London*, i, 1857, p. 112.

Hab. Borneo.

*unisonatus*, Rondani, *Ann. Mus. Civ. Genova*, vii, 1875, p. 459.

Hab. Borneo.

*albicinctus*, V. der Wulp, *Tijdschr. Entom.*, xi, 1868, p. 103.

Hab. Salawatti.

*striatus*, id., *Notes Leyden Mus.*, vii, 1885, p. 79.

Hab. Amoy, China.

*clavicornis*, Thomson, *Eugenie Resa, Stockholm*, 1858-68, p. 452.

Hab. Malacca.

## Genus PANGONIA.

Latr., *Hist. Nat. Crust. et Ins.*, iii, 1794, p. 437: *Tanyglossa*, Meigen  
*Klassif.* p. 174: *Tabanus* pt. Linn., Rossi, Fabr.: *Bombylius*, pt. Olivier,  
*Encycl. Method.*

*amboinensis*, Fabr., *Syst. Antl.*, p. 91.

Hab. Amboina, Himalayas.

*longirostris*, Walker, *List Dipt. Ins. Brit. Museum, London*, 1854, pt. v, *Suppl.*  
p. 139.

Hab. India.

*taprobanes*, id. *ibid.*, *Addenda*, 1854, p. 324.

Hab. Ceylon.

*rufa*, Macquart, *Dipt. Exot. Suppl.*, pt. iv, Paris, 1850, p. 18.

Hab. Bombay.

### Genus SILVIUS.

Meigen, *Syst. Besch.* ii, 1820, p. 27, Wiedem., Macq.: *Tabanus* pt.

*dimidiatus*, V. der Wulp, *Tijdschr. Entom.*, xi, 1868, p. 102.

Hab. SalaWatti.

### Genus HÆMATOPOTA.

Meigen, *Illig. Magaz.* ii, 1803, p. 267: *Tabanus* pt.

*cana*, Walker, *List Dipt. Ins. Brit. Mus. London*, pt. i, 1848, p. 207.

Hab. Bengal.

*atomaria*, id. *Journ. Proceed. Linn. Soc. London*, i, 1857, p. 112.

Hab. Borneo.

*irrorata*, Macquart, *Dipt. Exot.* pt. i, 1838, p. 163.

Hab. Java.

*lunulata*, id. *ibid.*, *Suppl.* ii, *Suites*, 1847, p. 15.

Hab. Java.

*roralis*, Fabr. *Syst. Antl.*, p. 107.

Hab. Tranquebar, Madras Pr.

*javana*, Wiedem. *Ausser. Europ. Zweifl. Ins.* i, Hamm, 1828, p. 218.

Hab. Jāva.

*cingulata*, id. *ibid.*, p. 216.

Hab. Java.

*borneana*, Rondani, *Ann. Mus. Civ. Genova*, vii, 1875, p. 461.

Hab. Borneo.

*pungens*, Doleschall, *Natuur. Tijdschr. Nederl. Indie*, x, Batavia, 1856, p. 407.

Hab. Java.

*oilipes*, J. Bigot, *Nouv. Archives Mus. Paris*, (3) ii, 1890, p. 205.

Hab. Laos.

*pachycera*, id. *ibid.*, p. 206.

Hab. Laos.

*maerocera*, id. *ibid.*, p. 207.

Hab. Laos.

Genus RHINOMYZA.

Wiedemann, *Nov. Dipt. Gener.*, 1820, p. 8.

*fusca*, Wiedem. *ibid.* p. 8.

Hab. Java.

Genus DITYLOMYIA.

J. Bigot, *Rev. et Mag. Zool. Guérin*, (2) xi, 1859, p. 305.

*ornata*, J. Bigot, *ibid.* p. 306.

Hab. Ceylon.

Genus TABANUS.

Linn, *Faun. Suec.* ii, 1761, p. 462, et auct.: *Theriopectes* pt. Zeller, *Isis Agelanius*, pt. Rondani, 1863: *Atylotus*, pt. Ost.-Sacken, 1876.

*auroinotus*, Macquart, *Dipt. Exot.* pt. i, Paris, 1838, p. 130.

Hab. Indian Archipelago.

*pusillus*, *id. ibid.*, p. 127.

Hab. China.

*albilateralis*, *id. ibid.*, p. 129.

Hab. Java.

*oerulescens*, *id. ibid.*, p. 128.

Hab. Java.

*basalis*, *id. ibid.*, p. 126.

Hab. India.

*brunneus*, *id.*, S. à Buff. *Dipt.* i, Paris, 1834, p. 203.

Hab. Java.

*sumatrensis*, *id. ibid.*, p. 201.

Hab. Sumatra.

*consanguineus*, *id.*, *Dipt. Exot.* pt. i, 1838, p. 127.

Hab. Malabar.

*servillei*, *id. ibid.*, p. 128.

Hab. India.

*rubicundus*, *id. ibid.*, *Supplem.*, 1846, p. 32.

Hab. India.

*dorsolinea*, Wiedem., *Analect. Entomol.* p. 22: *T. striatus* ? Fabr.

Hab. India.

*virgo*, *id. ibid.*, p. 22.

Hab. India.

*orientalis*, *id. ibid.*, p. 21.

Hab. India.

- rubidus*, id., *Dipt. Exot.*, i, p. 69.  
Hab. Bengal.
- ardens*, id. *ibid.*, p. 78.  
Hab. Java.
- immanis*, id. *Ausser Europ. Zweifl. Ins.*, i, Hamm, 1828, p. 123.  
Hab. Java.
- hybridus*, id. *ibid.*, p. 557.  
Hab. Macao, China.
- striatus*, Fabr., *Entom. System.*, iv, p. 371: *T. dorsolinea* ? Wiedem.  
Hab. China; Java.
- rufiventris*, id. *ibid.*, p. 96.  
Hab. India.
- javanus*, id. *Syst. Anth.*, p. 103.  
Hab. Java.
- tenebrosus*, Walker, *List Dipt. Ins. Brit. Mus. London*, v, *Suppl.* p. 242.  
Hab. Malabar.
- pyrausta*, id., *Zoologist*, vii, 1849, *Append.* p. lxxv.  
Hab. Java.
- vagus*, id. *ibid.*, *Append.* p. lxxviii.  
Hab. Hong-Kong.
- megalops*, id. *List Dipt. Ins. Brit. Mus. London*, v, *Suppl.* i, 1854, p. 247.  
Hab. Java.
- aurotestaceus*, id. *ibid.*, p. 247.  
Hab. Shanghai.
- orientis*, id., *List Dipt. Ins. Brit. Mus.*, pt. i, 1848, p. 152, and v, *Suppl.* i, 1854  
*Addenda*, p. 328.  
Hab. Sikkim and Nepal.
- explicatus*, id., *ibid.* v, *Suppl.* i. 1854 *Addenda*, p. 328.  
Hab. Sikkim.
- univentris*, id. *ibid.*, i, 1848, p. 151.  
Hab. Borneo.
- auriflamma*, id. *ibid.*, p. 155.  
Hab. Silhet, Assam.
- insoitus*, id. *ibid.*, p. 161.  
Hab. Silhet, Assam.
- mentitus*, id. *ibid.*, p. 162.  
Hab. China.
- sincus*, id. *ibid.*, p. 163.  
Hab. Hong-Kong.

*amoenus*, id. *ibid.*, p. 163.

Hab. Hong-Kong.

*internus*, id. *ibid.*, p. 164.

Hab. Silhet.

*jucundus*, id. *ibid.*, p. 187.

Hab. Hong-Kong.

*albulus*, id. *Ins. Saunders. Dipt. i*, London, 1856, p. 46.

Hab. India.

*pyrrhus*, id. *ibid.*, p. 47.

Hab. India.

*albimedinus*, id. *ibid.*, p. 48.

Hab. India.

*tenens*, id. *ibid.*, p. 49.

Hab. India.

*hilaris*, id. *ibid.*, p. 49.

Hab. India.

*crassus*, id. *ibid.*, p. 50.

Hab. India.

*vagus*, id. *ibid.*, p. 50.

Hab. India, Java.

*rubiginosus*, id. *ibid.*, p. 51.

Hab. India.

*umbrosus*, id. *ibid.*, p. 52.

Hab. India.

*hirtus*, id. *ibid.*, p. 52.

Hab. India.

*puella*, id. *ibid.*, p. 53.

Hab. India.

*sanguineus*, id. *ibid.*, p. 54.

Hab. Java.

*obconicus*, id. *ibid.*, p. 54.

Hab. India.

*consootus*, id. *ibid.*, p. 56.

Hab. India.

*perlinae*, id. *ibid.*, p. 56.

Hab. India.

*nigropictus*, Macquart, *Dipt. Exot. Suppl.*, v, Paris, 1855, p. 24.

Hab. India.

*yao*, id. *ibid.*, p. 24.

Hab. North China.



*clausicella*, (*Bellardia*, Rondani), id. *ibid.*, p. 25.

Hab. China.

*confucius*, id. *ibid.*, p. 26.

Hab. China.

*hoang*, id. *ibid.*, p. 27.

Hab. China.

*bubali*, Doleschall, *Natuur. Tijdschr. Nederl. Indie, Batavia*, x, 1856, p. 407.

Hab. Java.

*monoculus*, id. *ibid.*, xvii, 1858, p. 85.

Hab. Java.

*cinnamomeus*, id. *ibid.*, xvii, 1858, p. 84.

Hab. Amboina.

*furunculigenus*, id. *ibid.*, xvii, 1858, p. 84.

Hab. Amboina.

*abscondens*, Walker, *Trans. Ent. Soc. London*, v, 1860, p. 275.

Hab. Burmah.

*univentris*, (*nomen bis lectum*) id. *ibid.*, i, 1857, p. 9.

Hab. Mt. Ophir; Borneo.

*partitus*, id. *ibid.*, i, 1857, p. 9.

Hab. Singapore.

*nexus*, id. *ibid.*, i, 1857, p. 110.

Hab. Borneo.

*fumifer*, id. *ibid.*, i, 1857, p. 110.

Hab. Borneo.

*optatus*, id. *ibid.*, i, 1857, p. 111.

Hab. Borneo.

*simplicissimus*, id. *ibid.*, i, 1857, p. 111.

Hab. Borneo.

*serus*, id. *ibid.*, vi, 1862, p. 20.

Hab. Ceram.

*justorius*, Rondani, *Ann. Mus. Civ. Genova*, 1875, p. 455.

Hab. Sarawak.

*albocutatus*, id. *ibid.*, p. 456.

Hab. Sarawak.

*pauper*, id. *ibid.*, p. 456.

Hab. Sarawak.

*ignobilis*, id. *ibid.*, p. 457.

Hab. Sarawak.

*dives*, id. *ibid.*, p. 457.

Hab. Sarawak.

*fulvissimus*, id. *ibid.*, p. 458.

Hab. Sarawak.

*variegatus*, id. *ibid.*, p. 458.

Hab. Sarawak. .

*apicalis*, id. *ibid.*, p. 459.

Hab. Sarawak.

*geniculatus*, V. der Wulp, *Midden Sumatra*, iv, *Natuurlijke Histoire, Diptera*, p. 46.

Hab. Sumatra.

*incultus*, id. *ibid.*, p. 17.

Hab. Sumatra.

*tristis*, id. *ibid.*, p. 17.

Hab. Sumatra.

*fumipennis*, id. *ibid.*, p. 18.

Hab. Sumatra.

*minimus*, id. *ibid.*, p. 18.

Hab. Sumatra.

*equestris*, id., *Notes Leyden Mus.*, vii, 1885, p. 77.

Hab. Sumatra, Java and Borneo.

*felderi*, id. *ibid.*, p. 78.

Hab. Ning-po, China.

*bucolicus*, Schiner, *Novara Reise*, 1868, p. 81.

Hab. Hong-Kong.

*nicobarensis*, id. *ibid.*, p. 81.

Hab. Nicobar Islands.

*mandarinus*, id. *ibid.*, p. 83.

Hab. Hong-Kong.

*administrans*, id. *ibid.*, p. 83.

Hab. Hong-Kong.

*ceylanticus*, id. *ibid.*, p. 93.

Hab. Ceylon.

*leucosparsus*, J. Bigot *N. Archives Mus. Paris*, (3) ii, 1890, p. 203.

Hab. Laos.

*nigrotectus*, (*Bellardia*, Rondani), id. *ibid.*, p. 204.

Hab. Laos.

*melanognathus*, (*Atylotus*, Ost.-Sacken), id. *ibid.*, p. 204.

Hab Laos.

*laotianus*, (*Atylotus*, Ost.-Sacken), id. *ibid.*, p. 205.

Hab. Laos.

### Family STRATIOMYDI.

- J. Bigot, *adhus ined.*, 1891: Stratiomydæ, Latr. 1802: Xylophagei, Fall.  
 1810: Notachanta, Latr. 1817: id. Macquart, 1834: Notachanten,  
 Brauer 1882: Stratiomydæ, Leach, 1819: id. Rondani, 1856: Stratiomydinæ, Rondani, 1856: Stratiomydes Latr. 1802: Xylophagi, Meigen, 1820: Xylophagidæ Steph., 1829: id. Rondani, 1856: id. Bigot: Xylophagina, Rondani, 1836: Xylophagi, Walker, 1848: Beridæ, Westwood, 1840: Beridina, Rondani, 1836: Cœnomydæ, Westwood, 1840: Cœnomyna, Rondani, 1836: Sicarii, Latr., 1825: id. Macq. 1834: Polychoeta, Zetterstedt.

### Genus XYLOPHAGUS.

Meigen, *Illig. Magaz*, ii, 1808, p. 266.

*brunneus*, Wiedem., *Auss. Europ. Zweifl. Ins.* pt. iv, Hamm, 1828, p. 85.

Hab. India.

### Genus ANTIDOXION.

Sneller V. Vollenhoven, *Versl. en Med. K. Akad. Wetensch.* xv, 1863.

*flavicornis*, id. *ibid.*

Hab. Java.

### Genus ACRASPIDEA.

Schiner in *lit.*, V. Brauer *Zweifl. K. Mus. Wien.*, 1882, p. 75-19.

*felderi*, id. *ibid.*, p. 76-20.

Hab. Ceylon.

### Genus SUBULA.

Meigen, *Syst. Besch.* ii, 1820, p. 15: Xylophagus, pt.

*calopodata*, J. Bigot, *Ann. Soc. Ent. France*, (5) ix, 1879, p. 195.

Hab. Ternate.

*flavipes*, Doleschall, *Natuur. Tijdschr. Nederl. Indië*, xvii, 1858, p. 85.

Hab. Amboina.

*vittata*, id. *ibid.*, p. 86.

Hab. Amboina.

*inamena*, (*Solva*) Walker, *Journ. Proceed. Linn. Soc. London* iv, 1860, p. 98: Ost.-Sacken, *Ann. Mus. Genova*, xvi, p. 407.

Hab. Java; Celebes.

#### Genus THYLACOSOMA.

Schiner in *lit.*, V. Brauer, *Zweiflug. K. Mus. Wien.*, 1882, p. 77: ? Rubs, pt. Walker,

*amboinense*, Schiner in *lit.*, V. Brauer, *loc. cit.*, p. 77.

Hab. Amboina.

#### Genus ENGONIA.

Schiner, in *lit.*, V. Brauer, *Zweifl. Mus. Wien.*, 1882, p. 76: *Negritomyia*?

J. Bigot, *Ann. Soc. Ent. France*, (5) ix, 1877, *Bulletin*, p. lxxiv.

*aurata*, Schiner, in *lit.*, v. Brauer, *loc. cit.*, p. 76.

Hab. Amboina.

#### Genus NEGRITOMYIA.

J. Bigot, *Ann. Soc. Ent. France*, 1877, *Bulletin*, p. lxxiv.

*bilineata*, (*Stratiomys*) Fabr. *Syst. Antl.* p. 79: V. der Wulp, *Notes Leyd. Mus.* vii. p. 59.

Hab. Java.

#### Genus CLITELLARIA.

Meigen, *Illig. Magaz.*, ii, 1803, p. 265: *Ephippium*, Latr., 1802: *Rhaphiocera* pt. Macq.: *Stratiomys*, pt. Fabr. *Syst. Antl.*

*heminopla*, Wiedem., *Auss. Europ. Zweifl. Ins.* ii, Hamm, 1830, p. 48: id., *Zool. Mag.* iii, p. 80.

Hab. Tranquebar, Madras Fr.

*varia*, Walker, *List Dipt. Ins. Brit. Mus.*, pt. v, Suppl. i, London, 1854, p. 63.

Hab. Java.

*angusta*, id *loc cit.*, p. 62: *Ephippium* id., Macq. *S. d. Buff. Dipt.* i, 1834, p. 252.

Hab. Java.

*tenebrica*, id., *loc. cit.*, iii, 1849, p. 522.

Hab. Java.

*notabilis*, Walker, *Journ. Proceed. Linn. Soc. London*, i, 1857, p. 108.

Hab. Borneo.

*bivittata*, Wiedem., *Auss. Europ. Zweifl. Ins.*, ii, Hamm, 1830, p. 46: *Stratiomys bilineata*, Fabr. *Syst. Antl.*: *Ephippium spinigerum* ? Dolesch.: *Rhaphiocera spinithorax* Macq. *Dipt. Es.*

Hab. Java.

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*spinigerum*, (*Ephippium*) Doleschall, *Natuur. Tijdschr. Nederl. Indie*, x, 1856, p. 407: Engonia, id. Schin., Brauer.

Hab. Java.

*nigerrimum*, (*Ephippium*) Doleschall, *loc. cit.*, xvii, 1858, p. 81.

Hab. Java.

*flaviceps*, Walker, *Journ. Proceed. Linn. Soc. London*, i, 1857, p. 7.

Hab. Singapore.

#### Genus BERIS.

Latr., *Hist. Nat. Crust. et Ins.* iii, 1802, p. 340: *Stratiomys*, pt. Fabr., Fall.:  
*Actina*, pt. Meig.

*javana*, Macquart, *Dipt. Exot.* i, pt. ii, Paris, 1838, p. 188.

Hab. Java.

#### Genus CULCUA.

Walker, *Journ. Proceed. Linn. Soc. London*, i, 1857, p. 109.

*simulans*, Walker, *ibid.*, p. 109.

Hab. Borneo, Malacca.

#### Genus CYCLOGASTER.

Macquart, *S. à Buff. Dipt.* i, Paris, 1834, p. 256.

*radians*, Walker, *Journ. Proceed. Linn. Soc. London*, i, 1857, p. 7.

Hab. Singapore.

#### Genus HERMETIA.

Latr. *Dict. Hist. Nat.* xxiv, p. 192, Fabr., Wied., Macq.: *Nemotelus*, pt.  
Degeer.: *Bibio*, *Syrphus*, *Mydas*, pt. auctor.: *Xylophagus*, pt. Lamarck.

*melanessiae*, Bigot, *Ann. Soc. Ent. France*, (5) ix, 1879, p. 202: *H. batjanensis*,  
V. der Wulp, *Tijdschr. Entom.*, xxiii, p. 161: *Massiocta cerioides* Walker. ?

Hab. Indian Archipelago.

*rufiventris*, (*Nomen bislectum*) Walker, *Journ. Proceed. Linn. Soc. London*, v, 1861,  
p. 145.

Hab. Amboina.

#### Genus PHYLLOPHORA.

Macquart, *Dipt. Exot.* i, pt. i, Paris, 1838, p. 178.

*angusta*, Walker, *Journ. Proceed. Linn. Soc. London*, i, 1857, p. 7.

Hab. Singapore.

Genus TINDA.

Walker, *Journ. Proceed. Linn. Soc. London*, iv, 1860, p. 101.

indica, V. der Wulp, *Notes Leyd. Mus.*, vii, 1885, p. 57; Blartes id. Walker, *Ins. Saunders. Dipt.*, i, London, 1856, p. 87; Tinda modifera, Walker, *Journ. Proceed. Linn. Soc. London*, iv, 1860, p. 101; Phyllophora bispinosa, Thomson, *Eugenie Esca*, p. 454.

Hab. Java, Manilla.

Genus EVAZA.

Walker, *Journ. Proceed. Linn. Soc. London*, i, 1857, p. 109.

bipars, Walker, *ibid.*, p. 110.

Hab. Borneo.

flavipes, J. Bigot, *Ann. Soc. Ent. France*, (5) ix, 1879, p. 219.

Hab. India.

argyroceps, id. *ibid.*, p. 219.

Hab. The Moluccas.

fulviventris, id. *ibid.*, p. 220.

Hab. The Moluccas.

Genus NERNA.

(nec Nerua) Walker, *Journ. Proceed. Linn. Soc. London*, iii, 1859, p. 81.

mollis, Ost.-Sacken, *Ann. Mus. Civ. Genova*, xvi, 1881, p. 415.

Hab. Sumatra.

Genus PTILOCHRA.

Wiedem., *Auss. Europ. Zweifl. Ins.* ii, Hamm, 1830, p. 58; Stratiomys, pt.

quadridentata, Wiedem., *loc. cit.*, p. 59.

Hab. Java.

continus, Walker, *Ins. Saunders. Dipt. London*, 1856, pt. i, p. 84.

Hab. Java.

amaragdina, Snellen v. Vollenhoven, *Mem. Entomol. Pays-Bas*, i, 1858, p. 92.

Hab. Celebes.

amethystina, id. *ibid.*, p. 92.

Hab. Amboina, Java and Celebes.

\* fastuosa, Gerstaecker, *Linn. Ent.* xi, 1857, p. 333.

Hab. Ceylon.

Genus WALLACEA.

Doleschall, *Naturk. Tijdschr. Nederl. Indië*, xvii, Batavia, 1858, p. 82.

*argentea*, Doleschall, *loc. cit.*, p. 82.

Hab. Amboina.

Genus ACRASPIDEA.

Brauer, *Zweifl. Kais. Mus. Wien*, 1882, p. 19.

*felderi*, Brauer, *loc. cit.*, p. 20.

Hab. Ceylon.

Genus ACANTHINA.

Wiedem., *Auss. Europ. Zweifl. Ins.* ii, Hamm, 1830, p. 50.

*saurea*, Gerstaecker, *Linn. Ent.*, xi, 1857, p. 335.

Hab. Ceylon.

Genus ELASMA.

Jaennicke, *Neu. Exot. Dipter. Frankfurt*, 1867, p. 14.

*acanthinoidea*, Jaennicke, *loc. cit.*, p. 15.

Hab. Java.

Genus PACHYGASTER.

Meigen, *Illig. Magaz.*, ii, 1803, p. 266 : *Nemotelus*, pt. Panzer : *Sargus*, pt. Fall. : *Vappo*, pt. Latr.

*rustarsis*, Macquart, *Dipt. Exot. Paris, Suppl.* 1846, p. 57.

Hab. Pondicherry.

Genus TOXOCERA.

Macquart, *Dipt. Exot. Suppl.* iv, Paris, 1850, p. 44.

*limbiventris*, Macq., *loc. cit.*, p. 45.

Hab. Java.

Genus MASSICYTA.

Walker, *Journ. Proceed. Linn. Soc. London*, i, 1857, p. 8.

*bicolor*, Walker, *loc. cit.*, p. 8.

Hab. Singapore.

Genus RHACHICERUS.

Haliday, *List Dipt. Ins.* 1848, p. 154.

*sonotus*, Ost. Sacken, *Ann. Mus. Genova*, xvi 1881, p. 408.

Hab. Sumatra.

Genus STRATIOMYS.

Geoffr. *Hist. Nat. Ins.* ii, 1764: Hirtea, pt. Scopoli: *Hoplomyia*, Zeller, Loew.

*barca*, Walker, *List Dipt. Ins. Brit. Museum*, London, 1849, p. 530.  
Hab. China.

*garatas*, id. *ibid.*, p. 532.  
Hab. China.

*apicalis*, id. *ibid.*, Part v, 1854, p. 53.  
Hab. North China.

*lutatius*, id. *ibid.*, 1849, p. 532.  
Hab. Malacca.

*solennis*, id., *Ins. Saunders. Diptor. London*, i, 1856, p. 79.  
Hab. India.

*inanimis*, id., *Trans., Ent. Soc. London*, iv, 1857, p. 121.  
Hab. China.

*viridana*, Wiedem., *Auss. Europ. Zweifl. Ins.*, ii, Hamm, 1830, p. 66.  
Hab. Bengal.

*minuta*, Fabr., *Entom. System.*, iv, p. 268.  
Hab. Tranquebar, Madras Pr.

*pusilla*, id. *ibid.*, p. 271  
Hab. Tranquebar, Madras Pr.

*rufipennis*, Macquart, *Dipt. Exot. Suppl. v. Paris*, 1855, p. 42.  
Hab. South China.

*flavoscutellata*, V. der Wulp, *Notes Leyd. Mus.* vii, 1885, p. 60.  
Hab. Java.

Genus ODONTOMYIA.

Meigen, *Klassific.* i, 1804, p. 123: *Stratiomys*, pt. apud V. der Wulp.

*viridana*, Wiedem., *Analect. Entom.*: Macquart *Dipt. Exot. Suppl.*, iv, 1850, p. 43.  
Hab. Bengal.

*consobrina*, Macquart, *Dipt. Exot., Suppl.*, ii, Paris, 1847, p. 16.  
Hab. Java.

*diffusa* (*Stratiomys*) Walker, *List Dipt. Ins. Brit. Mus.*, part v, London, 1854, p. 53.  
Hab. Java.

*mutica*, V. der Wulp, *Notes Leyd. Mus.* vii, 1885, p. 62.  
Hab. Ternate.



Genus CAMPEPROSOPA.

Macquart, *Dipt. Exot. Suppl.*, iv, 1850, p. 46.

flavipes, Macquart, *loc. cit.*, p. 46.

Hab. Java.

munda, Osten-Sacken, *Ann. Mus. Civ. Genova*, 1881, p. 409.

Hab. Sumatra.

Genus CHEYSOCHLORA.

Latr. *Fam. Natuur.*, 1825, Macquart: Sargus, pt.

baccoides, Rondani, *Ann. Mus. Civ. Genova*, vii, 1875, p. 454.

Hab. Sarawak.

vitripennis, Doleschall, *Natuur. Tijdschr. Nederl. Indie.*, x, 1856, p. 408.

Hab. Java.

Genus MICROCHRYZA.

Loew, *Verhandl. K. K. u. b. Gesellsch. Wien*, 1855, p. 146: Sargus, pt.

gemma, J. Bigot, *Ann. Soc. Ent. France*, (5) ix, 1879, p. 231.

Hab. Ceylon.

Genus TRICHOCHÆTA.

J. Bigot, *Ann. Soc. Ent. France*, (5) ix, *Bullet.* 1878 p. xxii, et errata.

nemoteloides, id. *ibid.*, p. xxii.

Hab. Ternate.

Genus RAPHIOCERA.

Macquart, *S. à Buff. Dipt.*, i, 1834, p. 253.

spinithorax, Macquart, *Dipt. Exot. Suppl.* ii, Paris, 1847, p. 17: *Stratiomys bilineata*, Fabr.: *Clitellaria bivittata* Wiedem.: *Ephippium spinigerum*, Doleschall;

Hab. Java.

Genus PTECTICUS.

Loew, *Verhandl. K. K. u. b. Gesellsch. Wien.*, v, 1855, p. 142.

apicalis, Loew, *loc. cit.*, p. 142.

Hab. Pinang.

cingulatus, id. *ibid.*, p. 142.

Hab. Pinang.

*australis*, Schiner, *Novara Reise*, 1868, p. 65.

Hab. Nicobar Islands.

*illustris*, id. *ibid.*, p. 65.

Hab. Nicobar Islands.

*apicalis*, (nom. *bialectum*), V. der Wulp, *Notes Leyden Museum*, vii, 1885, p. 62.

Hab. Sumatra, Borneo.

*brevipennis*, V. der Wulp, *loc. cit.*, p. 63 : Sargus id. Rondani, *Ann. Mus. Civ. Genova*, vii, 1875, p. 454.

Hab. Borneo, Java.

*latifascia*, V. der Wulp, *loc. cit.*, p. 64 : Sargus, id. Walker *Journ. Proceed. Linn. Soc. London*, i, 1857, p. 110.

Hab. Borneo, Java.

#### Genus SARGUS.

Fabr. *Entom. System. Suppl.*, 1798, p. 566 : Rhagio pt. Schrank : Nemotelu pt. Degeer.

*gemmifer*, Walker, *List Dipt. Ins. Brit. Mus.* iii, London, 1849, p. 516.

Hab. Sylhet, Assam.

*tenebrifer*, id. *ibid.*, p. 517.

Hab. China.

*aurifer*, id. *ibid.*, v. *Suppl.* i, London, 1854, p. 96.

Hab. India, China.

*luridus*, id. *Journ. Proceed. Linn. Soc. London*, i, 1857, p. 8.

Hab. Singapore.

*quadrifasciatus*, id. *ibid.*, v, 1861, p. 146.

Hab. Amboina.

*metallicus*, Fabr., *Syst. Anth.*, p. 258 : V. der Wulp, *Notes Leyd. Mus.* vii, 1885, p. 65.

Hab. Bengal ; Java.

*longipennis*, Wiedem., *Analect. Entomol.*, p. 31.

Hab. Java.

*insignis*, Macquart, *Dipt. Esot. Suppl.*, v, Paris, 1855, p. 16.

Hab. China.

*viridiceps*, id. *ibid.*, 1856, p. 110 : Ptecticus id. V. der Wulp.

Hab. China.

*pallipes*, Bigot, *Ann. Soc. Ent. France*, (5) xi, 1879, p. 222.

Hab. Ceylon.

*magnificus*, id. *ibid.*, p. 222.

Hab. Assam.

*rufus*, Doleschall, *Naturk. Tijdschr. Nederl. Indie*, xvii, *Batavia*, 1858, p. 83.  
Hab. Amboina.

*ferrugineus*, id. *ibid.*, p. 83.  
Hab. Amboina.

*formicæformis*, id. *ibid.*, xiv, 1857, p. 403 : Sarg. *metallinus*, V. der Wulp.  
Hab. Amboina.

*leoninus*, Rondani, *Ann. Mus. Civ. Genova*, vii, 1875, p. 454.  
Hab. Sarawak.

*sevipennis*, id. *ibid.*, p. 454 : Ptecticus id., V. der Wulp.  
Hab. Sarawak.

*lætus*, V. der Wulp, *Notes Leyden Mus.* vii, 1885, p. 66.  
Hab. Sumatra.

*rubescens*, id. *ibid.*, p. 67.  
Hab. Gorontalo.

#### Genus CHRYSOMYIA.

Macquart, *S. à Buff. Dipt. Paris*, 1834, p. 262 : Sargus, pt. et Nemotelus,  
pt. Degeer.

*flaviventris*, Wiedem., *Analect. Entom.*, p. 31 : Sargus id., Macquart, *Dipt. Exot.* :  
*Microchryza* id., Ost.-Sacken, 1881.  
Hab. India, Java.

*affinis*, id. *ibid.*, p. 31 : Sargus id., Macquart, *Dipt. Exot.*  
Hab. India.

#### Genus EUDMETA.

Wiedem., *Auss. Europ. Zweifl. Ins. Hamm*, 1830, p. 43 : Hermetia, pt.

*marginata*, Wiedem., *loc. cit.*, p. 45 : Hermetia, id. Fabr., *Syst. Anth.* p. 63 : Herme-  
tia *cingulata* (vel *cingulalis*), Guerin, *Icon. Regn. Anim.*, p. 543.  
Hab. Amboina, Java.

#### Family NEMESTRINIDI.

J. Bigot, *adhus ined.* : Nemestrinidæ, Macquart, *S. à Buff. Dipt.*, i, *Paris*,  
1834, p. 370 : Anthracii et Bombyliarii, Latr. : Nemestrinidæ, Schiner  
*Faun. Austr., Flieg.*, i, 1862, *Wien.*, p. 44.

#### Genus NEMESTRINA.

Latr. *Hist. Nat. Crust. et Ins.* xiv, 1804, p. 319.

*javana*, Macquart *Dipt. Exot.* ii, pt. i, *Paris*, 1840, p. 17.  
Hab. Java.

Genus COLAX.

Wiedem., *Analecta Entomol.*, 1824.

*javanus*, Wiedem., *loc. cit.*, 1824, p. 18.

Hab. Java.

*variegatus*, Westwood, *Cabinet of Orient. Entomol.*, London, p. 38.

Hab. China.

Family LEPTIDI.

J. Bigot, *adhuc ined.*: Leptides, Moigen, *Syst. Besch.* ii, 1820: Lept. Mo,  
Westw., *Introd. Entom.*, 1840: Schiner, *Faun. Austr. Flieg.* i, Wien,  
1862, p. 170.

Genus LEPTIS.

Fabr., *Syst. Anth.*, 1806, p. 9: Nemotelus, pt. Degeer: Rhagio, pt. Latr.,  
Olivier, Walker.

*decisa*, Walker, *Journ. Proceed. Linn. Soc. London*, i, 1857, p. 15.

Hab. Malacca.

*uniguttata*, Ost.-Sacken, *Ann. Mus. Civ. Genova*, xvi, 1881, p. 422.

Hab. Sumatra.

Genus HELIOMYIA.

Doleschall, *Naturk. Tijdschr. Nederl. Indie*, xiv, *Batavia*, 1857, p. 402,  
*Chrysopyla* ? pt.

*ferruginea*, Doleschall, *loc. cit.*, p. 402.

Hab. Amboina.

Genus ATHERIX.

Meigen, *Illig. Magaz.*, 1803, p. 271: Rhagio pt. Fabr.: Bibio, pt. Fabr.: Leptis,  
pt. Fabr., Fall.: Ibisia, pt. Rondani.

*nigritarsis*, Doleschall, *Naturk. Tijdschr. Nederl. Indie*, xvii, *Batavia*, 1858, p. 92.

Hab. Amboina.

*labiatus*, Bigot, *Bull. Soc. Zool. France*, xii, *Paris*, 1887, p. 21.

Hab. Ceylon.

Genus CHRYSOPILA.

Maoquart, *Dipt. Nord. France*, i, 1827: Leptis, pt. Moigen: Rhagio, pt.  
Latr., Walker: Atherix, pt. Fabr.

*maculipennis*, Walker, *Journ. Proceed. Linn. Soc. London*, i, 1857, p. 118.

Hab. Borneo.

*lupina*, Ost.-Sacken, *Ann. Mus. Civ. Genova*, 1861, p. 420.  
Hab. Sumatra.

*uniguttata*, id. *ibid.*, p. 422.  
Hab. Sumatra.

*ferruginosa*, id. *ibid.*, p. 419; *Leptis* id., *Wiedem. Zool. Magaz.*, iii, p. 4.  
Hab. Java. and N. Ceram.

*insularis*, Schiner, *Novara Reise*, 1868, p. 119.  
Hab. Nicobar Islands.

#### Genus SURAGINA.

Walker, *Journ. Proceed. Linn. Soc. London*, iv, 1860, p. 110.

*signipennis*, id. *ibid.*, vi, 1862, p. 8.  
Hab. Ternate.

#### Family CYRTIDI.

J. Bigot, *adhuc in ed.*: *Vesiculosidæ*, Bigot (*olim*): *Acrocera*, Meigen, 1803;  
*Acroceridæ*, Leach, 1819; *Acrocerinæ*, Zetterst., 1842; *Inflatæ*, Latr.,  
1809; *Cyrtidæ*, *Oncodinæ*, Rondani, 1846.

#### Genus ONCODES.

Latr. *Precis*, 1796, p. 154: *Henops*, Illiger, 1798, (*alias Oggeodes*.)

*costalis*, (*Henops*), Walker, *Ins. Saunders. Dipt. London*, i, 1856, p. 203.  
Hab. India.



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*Natural History Notes from H. M.'s I. M. Survey Steamer "Investigator," Commander R. F. HOSKYN, R. N., Commanding—*  
No. 25. *The Vegetation of the Coco Group.*—By D. PRAIN.

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### § INTRODUCTORY.

The Cocos are a small group of three islands, Table Island, Great Coco, and Little Coco, lying about 30—45 miles north of Landfall Island, the most northerly of the Andaman group proper, in Lon.  $93^{\circ} 21'$  E., Lat.  $13^{\circ} 56'$  to  $14^{\circ} 10'$  N., and form one of the links in the island-chain that stretches southwards from Cape Negrais in Arracan to the Nias Islands off the western coast of Sumatra.

The first link in this chain is Diamond Island, Lon.  $94^{\circ} 18'$  E., Lat.  $15^{\circ} 51'$  N., 8 miles south of Cape Negrais and 130 miles north-north-east of the Cocos; the next is the island of Preparis, (not yet botanically investigated), larger than Diamond Island but smaller than the Great Coco, 80 miles south-south-west from Diamond Island and 50 miles to the north of the Cocos. The strait between Diamond island and Preparis is somewhat under 100 fathoms, that between Preparis and the Cocos somewhat over that depth. The channel between the Great and the Little Coco is under 50 fathoms, a depth not greatly if at all exceeded in the passage between the Cocos and Landfall. The next link in the chain is the Andaman Group proper, extending from about Lat.  $10^{\circ} 40'$  to

13° 45' N., consisting of several large islands that are separated by straits and channels which, with the exception of a passage 30 miles wide and about 100 fathoms deep between Rutland Island and Little Andaman, are all very narrow and usually quite shallow. Further south we find in the same chain the Nicobar Islands; these, separated by wider intervals than the members of the Andaman Group are, extend from 6° 45' to 7° 15' N. Besides being wider, the passages between the individual islands here are much deeper and the main channels between the Andamans and Nicobars on the one hand, and between the Nicobars and Sumatra or the Nias Islands on the other, in place of being under 150 fathoms deep, give soundings of 500, 750, and even 900 fathoms. There is, however, along the line from Little Andaman to the island of Simalu or to Achcen Head an undoubted ridge, for the floor of the Sea of Bengal to the westward is 2,000 fathoms deep, and that of the Andaman Sea to the eastward is in some places at as great a depth. Whether any portion of the now submarine sections of the southern, or Nicobars half of this ridge has ever been subaërial it is difficult to say but it seems likely from its present physiographical configuration that the most recent land connection must have been between the northern or Andaman half of the ridge and the adjacent Indo-Chinese district of Arracan.

Table Island, the most northerly member of the Coco group, and lying 45 miles north of Landfall, is about a mile across and is rather longer than broad, with a considerable outlying islet, Slipper Island, at its north-west corner; southward, across a strait about two miles wide, lies the Great Coco some 9 miles long from north to south and about  $2\frac{1}{2}$  across at the widest part with several small islets off both its east and west coasts and with a very considerable outlying islet, Jerry Island, at its southern extremity; finally, some 6 miles south-west of Great Coco, and 30 miles north of Landfall, is the Little Coco about  $2\frac{1}{2}$  miles long from north to south and  $\frac{1}{2}$  to  $\frac{3}{4}$  a mile wide.

Through the kindness of Capt. Hoskyn, R.N., the writer, in company with Dr. Alcock of H. M. I. M. "Investigator," has been able to visit the group on two occasions. On Nov. 30th and Dec. 1st, 1889, Table Island was examined. On Dec. 2nd, 1889, a naturalist's party, which the writer was privileged to join, landed on Great Coco and remained encamped on a small cleared hill in its north-eastern peninsula until Dec. 8th. From Nov. 14th till Nov. 23rd, 1890, a similar party, of which the writer again was a member, was encamped on a sandy spit covered with coco-nut trees at the south end of the island; while between Nov. 25th and Nov. 30th, 1890, the Little Coco was examined.

On Table Island is situated the well known lighthouse of this name and the western slopes of the main island as well as most of Slip-

per Island, which at low-tide is not separated from the main island, are cleared on account of some cattle of which the lighthouse-keeper has charge. Throughout the rest of the island, however, except for a few pathways that have been cut on account of the cattle, the jungle is very dense and uniform. Around a bay at the south side of this island as well as on the north coast is a fringe of coco-nut trees. The height of Slipper Island is 110 feet; the highest point of Table Island proper is 150 feet. On the occasion of the visit referred to, the eastern half of the island, where the jungle is as yet intact, was traversed from south to north; the northern and western coasts were examined; the island was traversed from west to east along one of the cattle paths; the clearing was also examined for introduced weeds and escapes from cultivation.

On Great Coco Island there is a small clearing on a peninsula that forms the north-eastern extremity of the island, the site of an abandoned settlement which, some years ago, it was attempted to effect and where the writer was encamped during his first visit. Except at this point and on two or three of the more exposed cliffs and slopes on the western sea-face of the island, which are only grass-clad, there is a uniform jungle from end to end of the island and from base to summit of the numerous more or less parallel steep ridges that compose it. The shore is fringed with coco-nut trees in quite a thin belt where the ridges that compose the island come close to the shore, and this fringe is broken here and there where these ridges end in abrupt headlands; the belt widens however at the heads of the various bays and in two places in particular,—on the eastern side of the island along the bay that extends southward from the north-eastern peninsula already mentioned, as well as across the isthmus joining this peninsula to the main island and thence along the northern end of the island to the mouth of the principal creek—again, on the western side of the island for half a mile or more northwards from the southern end—this belt of coco-nut trees is 100 yards or more in width. Where the beach meets the coco-nut belt there is an invariable sea-fence of *Pandanus* with other ordinary Indian Ocean littoral plants; this fence is generally less dense where the beach is composed of sand than when it consists of coral shingle. Except on the very crests of the ridges, and sometimes even there, and on the more exposed western headlands, the forest is composed of very tall trees with below these a dense undergrowth; this undergrowth is particularly dense, owing to the number of creepers, on the crest of ridges destitute of tall trees, and on the slopes of the western sea-face that are not grassy. It is also very dense immediately behind the coco-nut belt especially if, as frequently happens, this belt passes insensibly into the mudflats that characterise the outskirts of a mangrove swamp. On the sides of ridges however, as



opposed to their crests, the under-jungle is not so dense, largely owing to the mass of creepers being carried up to the tall trees above, while on the neck of land that connects the main island with the peninsula at the north-east corner, and on the narrow, more level tongue that forms the south end of the main island and stretches towards Jerry Island, the jungle is rather opener and more penetrable than elsewhere. The height of the outlying north-eastern peninsula which probably at one time has been a separate islet, at least at high-tide, is 80 feet; the highest ridge of the main island has an elevation of 300 feet; the other ridges mostly reach from 150—200 feet. Jerry Island, the chief outlying islet off Great Coco, consists at the southern end of a low ridge 60 feet high with a vegetation quite like that of the ridges on the main island; the northern half, however, consists of a level spit stretching towards the main island; this spit is composed of coral-shingle, and though covered with coco-nut and other trees there is only a sparse undergrowth within its *Pandanus* belt. Between Jerry and the main island extend wide sandstone reefs on which the waves and currents have thrown up a small cyot of sand, coral-shingle, dead shells, and drift timber on which stranded fruits and seeds are germinating. The other outlying islets call for no remark; all of them look like detached continuations of particular ridges and most of them have the vegetation characteristic of these. During the first visit daily excursions were made into the island towards the northern and eastern parts; the jungle was found to be so dense on the ridges and the level ground so difficult owing to the ramifications of a considerable creek, which, with its concomitant mangrove swamps, finds an outlet into the northern bay, that it was only on one occasion that the western coast was reached. It was impossible to do anything like justice to the interior; still, the northern and north-eastern peninsulas, the northern half of the east coast, the north coast and about two miles of the west coast at the north end were fairly thoroughly examined. During the second visit, profiting by the experience of the former season, fewer attempts were made to force a passage in a straight line through all obstacles, and the edges of ridges—*juga ipissima*—were in particular carefully avoided. The compass was discarded, no particular objective in the shape of a hill visible from the sea-shore was permitted to occupy the attention exclusively; the easiest rather than the shortest road was chosen as the route to be followed. In this way the island was crossed in four or five different places, all, however, towards the southern end; the west coast was explored for about four miles and the east coast examined northwards as far as the point reached when working in the opposite direction in the previous year. The outlying islet, Jerry, was also examined fairly thoroughly and its coasts skirted.

Little Coco consists of several ridges the highest having an elevation of 200 feet. The ridge jungle is much as in the other islands, but the level land is more largely composed of a basis of coral-shingle than is the case in the other two islands and the undergrowth is not quite so dense as in the level land on Great Coco. The coco-nut fringe is quite as uniform as in the Great Coco, but there is only one point,—at the head of a shallow bay in the middle of the west coast,—where the belt is as much as thirty yards wide. During his visit to this island the writer was able to cut his way from west to east across the highest ridge; to cross in another part along more level and frequently swampy ground; to work through a lagoon that occupies the south-western part of the island, and to skirt the whole coast on two different occasions.

The islands have all the physical features of the Andaman islands of the main chain as opposed to those of the Archipelago lying to the north-east of Port Blair; the rocks indeed recall at once those of Ross Island and of the shores of Port Blair in South Andaman. They are also equally like those forming Diamond Island, off the Arracan coast at the mouth of the Bassein river and, as in these localities, are best seen at points where the inland ridges end in abrupt headlands or are continued as long reefs exposed wholly, or in part, at low-tide.\* Such reefs not infrequently rise into outlying islets. These islets are some distance from the main island, and are bare and rocky, or jungle-clad, according to size and exposure, those off the west coast being all very bare. The bays between the headlands are mostly wide and shallow, and are filled up, except opposite the mouths of creeks, with an accumulation of coral debris that becomes at times banked up, causeway-like, between the shore and an outlying island; these causeways are in some instances becoming stocked with the mangrove-vegetation of the neighbouring creeks.

The floor of these shallow bays is remarkably flat and uniform and is, at the sea-edge of the bay where the reef ends, generally rather shallower than it is within, so that at low-tide each bay consists of a long shallow pool, one to two feet deep, separated from the sea itself by a long low bank of exposed coral. The bottom of such a pool is usually covered by a close meadow of *Oymodocea ciliata*, but though this species is so common there seems to be no other marine phanerogam present. *Algae*, too, are remarkably inconspicuous, being of small size and very

\* For further notices of the physiography of the islands the reader is referred to Alcock; *Nat. Hist. Reports in Hoskyn, Administration Reports of the Marine Survey of India 1889-90*, pp. 14, 15; 1890-91, pp. 11, 12; where also notices of the fauna, particularly marine, will be found. In Hume; *The Islands of the Bay of Bengal in Stray Feathers*, vol. ii, pp. 111—119, an account of these islands will also be found; there the ornithology of the group is exhaustively discussed.

scarce; the only exceptions are *Turbinaria ornata*, which is fairly frequent both on the coral reefs and on the sandstone ledges; *Padina pavonia*, more common on the exposed sandstone reefs but less frequent on the coral than *Turbinaria*; and *Sargassum ilicifolium*, which is the only really common seaweed and which occurs in great meadows at the outer margins of the fringing reefs and sandstone ledges that are exposed at low-tide, as well as in the deeper water beyond.

Reefs such as those described are extremely common in all the islands of the Andaman and Nicobars groups that the writer has visited, and the marine vegetation is remarkably uniform in appearance as well as in specific constituents. On Car Nicobar, for example, as well as on Rutland Island, at the extreme south end of the Andaman main group, localities which the writer has visited on different occasions, it is hardly possible to detect a species not represented on the reefs of the Cocos. On similar reefs in South Andaman, however, a second species of *Oymodocea*, quite as profuse where it exists, but more local in its occurrence, has been gathered, and on a similar reef in Little Andaman large meadows of *Halophila ovalis* were found associated with those of *Oymodocea*. The beach between such a reef and the *Pandanus* sea-fence consists, so far as the writer's observations extend, almost exclusively of coral sand mixed with small shells or fine fragments of large shells. The heavy surf in such a bay as this breaks at the outer margin of the reef, and even at high-tide in rough weather the swell is so weakened there that the waves which break on the beach are not so heavy as to have any great erosive power. Indeed their effect appears to be on the whole accretive, for the sand that accumulates at the head of the bay becomes bound by *Ipomæa biloba*, *Sesuvium*, *Euphorbia Atoto*, etc., the *Pandanus* fence encroaches on the beds of *Ipomæa*; the coco-nut zone widens seawards, and behind it the first line of beach-forest, containing *Terminalia*, *Hernandia*, *Erythrina*, *Pongamia*, *Stephegyne*, *Thespesia*, and the second line of the same forest, characterised by *Mimusops*, *Gyrocarpus*, *Pisonia*, *Ardisia*, *Oycas* assert themselves in an area previously covered by the tides. In certain situations, too, the true mangroves stalk forward into the tolerably quiet waters of these bays, while in a different but equally effective manner, by sending up suckers from among its curious pith-like roots, *Avicennia* establishes itself upon the reef. The guyed and stilted habit of the former makes their position very secure; the latter, from the enormous area covered by its roots, must also be difficult to overthrow. The process of land-making behind a fringing reef, either as a sandy flat covered with coco-nut trees, or as a mangrove swamp spreading seawards, is well exemplified in the two bays lying respectively to the south and to the north of the position of the first season's

camp; the effects are so like what must result if land were slowly rising that it is only after careful examination of all the conditions that one's mind becomes disabused of this specious impression. There is no direct evidence that the land is rising and, as will be evident on considering what has been said above, there is no necessity for supposing that it is. But though this is a very common type of bay, it is not the only type. On Great Coco, in some cases, and on Little Coco very generally a different stage may be observed. The shallow pools described as existing between the surf-built embankment at the margin of the fringing-reef and the beach, have in them many living corals that raise great rings which rise to almost the surface of the water in the pool at low-tide and, like huge lichens, grow peripherally till they meet and coalesce. The surf, too, breaks off pieces of greater or smaller size which are lodged in the pool behind, and by-and-by become more or less cemented together. In this way the whole of a pool becomes in time completely filled up with growing coral and cemented blocks, and there are many reefs, especially on Little Coco, that are completely uncovered at low-tide, while small patches of similar reef are here and there seen that ordinarily the high-tides do not cover. The uniformity that the surfaces of some of these exposed reefs display is very striking. They are almost as even as a paved floor and are as bare and destitute of marine vegetation as they are of living coral. The edge of such a reef, in place of being a fairly continuous embankment higher than the floor of the bay behind, is now broken into hundreds of jagged gulleys through which the wave-wash from the almost level platform tears its way back to the deep water beyond the fringing-reef. The main interest of this stage of the reef is less, however, from the present point of view, its actual physical condition than its effect on the vegetation of the shore.

Behind a coral bay like one of those first described, and which characterises a less advanced stage of the history of the fringing-reef, has gone on a long and steady growth of land, with some shingle in it doubtless, especially as one approaches the nearest ridge, but chiefly composed of coral sand with a thin coating of humus derived from the vegetation it has supported. The main force of the surf has for long been spent on the outer embankment, and the force of the waves that at high-water passed over its top has been so much diminished ere these reached the beach that there they did not act destructively. Now all this is altered. At low-tide the force of the surf is still all expended on the edge of the reef, but as soon as the water has risen so high that the edge of the reef is covered, this force instead of being dissipated in the deeper water of a pool is accentuated as the breakers roll landward across a reef on which the water shallows slightly as the shore is approached; by the

time the surf ceases to break on the edge of the reef practically its whole force rolls in over this even and slightly shallowing reef till it falls on the shore in huge erosive breakers that eat away the soil, so that *Pandanus* fence, coco-nut zone, and beach-forest all in turn disappear, and the waves at high tide grind on the prostrate stems of huge *Mimusops*, *Ficus Rumphii*, and *Dipterocarpus* trees, and undermine the roots of their old companions that are still standing but that the next storm will lay beside those on the beach. But this active denudation no more indicates a sinking of the land than do the heightened reefs that cause the action indicate that the land has risen, and as direct indications either of rising or of sinking are altogether absent we must conclude that the islands are at present practically stationary. But it is interesting to find, as one does here, in adjacent bays, such diverse indications of the same condition.

There are bays of a third type in the group, few in number, however, and of small size, in which the water is deep quite up to the beach; the sweep of the waves in these is extremely large, even when the sea outside is quiet, owing to the strong currents that prevail round the islands. They have all, as might be expected, rocky sides; the beaches on which the waves break are of sand, not shingle, and owing apparently to this excessive sweep of the waves the *Pandanus* fence and coco-nut zone at the head of such a bay is a good number of yards away from the beach, a considerable sand-bank covered with *Ipomœa biloba*, *Vigna lutea* and other sand-binding species, intervening between the limits of ordinary tides and the woody vegetation.

The nature of the beaches behind the numerous long, comparatively flat sandstone ledges, exposed at low-water and therefore not coral-covered, has yet to be noted. Such beaches are always of coral-shingle mixed with large shells, the pieces of coral being rounded or oblong and sometimes of considerable size. The most remarkable example of such a beach in this group is that at the south end and south-east corner of Little Coco where the sandstone reef is particularly extensive and where the south-west monsoon must break with singular force. This beach consists of an abrupt shingle wall, in many places 6 or 7 feet high, and yet not much wider at the base than twice its own height. Though very steep towards the sea-face it slopes more gradually at the back; behind it at this point there stretches a low flat tract of muddy land not much higher than the reef itself, covered by a dense jungle of *Hibiscus tiliaceus*, *Vitex Negundo*, *Leea*, and similar shrubs, but with few trees, the whole loaded with tangled masses of *Cassytha*. The *Pandanus* fence is here particularly dense, and along with it are coco-nut trees growing on the shingle; from the appearance and size of these it seems clear that, slight

as the defence seems, this shingle beach completely prevents erosion though at the same time accretion is probably very slow. In the case of the highest and most advanced coral reefs usually the same shingle beach occurs; from which fact we might conclude that as the initial stage of any fringing-reef must have been that of a simple submerged sandstone ledge of greater or less extent, we see here the original shingle beach, thrown up where this ledge originally became subaërial, to which the waves have eaten back over the present raised reef until all the sandy soil formed during the earlier "embankment and pool" stage has, with the vegetation it supported, been swept into the sea. This shingle having been reached the erosive action has been checked, and the surer, if slower process of shingle accumulation has been initiated or, at all events, renewed. From this account of these bays it will be seen that the fringing-reef exhibits in some parts a phase more advanced than it exhibits in others. But it does not therefore follow that these more advanced "platform" portions are older than the earlier "embankment and pool" portions. They cannot, in one sense, be so old, for we must suppose that all these reefs commenced contemporaneously, and the "embankment and pool" reefs are still growing, whereas the "platform" reefs have now no living coral. The different stages therefore merely indicate that the sandstone reefs running out from the headlands in which the various ridges end are in different parts of the islands situated at different depths, and the condition of the reefs indicates that the sandstone ledges are shallower, and that deep water is further from the shore towards the south than towards the north end of the islands. At quite the southern extremity of Little Coco bare sandstone reefs, too shallow for the growth of a coral fringing-reef, stretch away south-eastward in much the same way as the well-known Alguada reefs extend southward off Cape Negrais. On the east coast of Little Coco are high coral reefs exposed at low-tide, fringed by a coral-shingle beach, while towards the north end of the island are similar high reefs fringed by a shore of sandy soil which, with the beach-forest growing on it, is being washed away by the sea. On the west coast, where the reefs are high, and, though still in the "pool" stage appear from their jagged edges to be approaching the "platform" stage, a line of low sand-dunes, perhaps the highest development of the epoch of sand-accretion, have been thrown up; these at present protect the shore and have actually closed up, at the south-west corner, the mouth of a mangrove-creek.

Similarly, in Great Coco, near the southern extremity and between the main island and Jerry there is a large bare sandstone reef which exhibits very well the arrangement and dip of the strata; further up the east coast denudation is going on, still further north the site of a beach-

forest is being composed by accretion, while at the north end a mangrove forest is invading the sea. The west coast of Great Coko is more or less rocky and abrupt, for nearly the whole extent of the island.

No denudation is taking place in Table Island, the shores of which rise rather abruptly from the beach in most of its circumference, though there is a bay at the north side looking towards Slipper Island that is fringed with *Pemphis acidula* and has a small flat space immediately within its *Pandanus* fence.

When the beach between the reef and the *Pandanus* sea-fence consists of coral sand it is usual to find outside the jungle proper a belt of *Ipomœa biloba*, at times covered with parasitic *Cassytha*; where it is composed of shingle *Ipomœa biloba* may also occur, though it is more usual to find its place taken by *Ipomœa denticulata*. Along with these *Ipomœas* occur *Euphorbia Atoto* and, less frequently, *Sesuvium Portulacas-trum*. Usually just within these occurs the common sea-face jungle-fence of *Pandanus*, *Sophora tomentosa*, *Cæsalpinia Bonducella*, *Tournefortia argentea*, *Desmodium umbellatum*, *Premna integrifolia*, *Clerodendron inerme*, *Colubrina asiatica*, *Canavalia obtusifolia*, *Vigna lutea*, *Guettarda speciosa*, *Allophylus Cobbe*, etc., and then, particularly if the beach is a shingle one, as trees in the same zone, *Ixora brunnescens*, *Terminalia Catappa*, very common, *Stephegyne diversifolia*, *Thespesia populnea*, *Hernandia peltata*, *Erythrina indica*, *Pongamia glabra*, *Ficus Rumphii*, *Barringtonia speciosa*, *Gyrocarpus Jacquinii*, etc., with a thin line of *Cocos nucifera* growing up slantingly beneath these and stretching their crowns seawards as if in search of light. Where the beach is sandy the sea-face jungle makes a less dense hedge, and within it lies a flat space of sandy soil with a grove of *Cocos nucifera*, stretching back from 10 to 100 yards to where, usually on lower and muddy ground tunnelled by *Cardisoma* and other land-crabs, commences a dense jungle that shades off almost insensibly into the vegetation of a true mangrove-swamp. The sand beneath the coco-nut trees in these groves is covered in Great Coko by a close sward of *Thuarea sarmentosa*, with here and there patches of *Ipomœa biloba*, clumps of *Tacca pinnatifida*, or large examples of *Crinum asiaticum* and *Cycas Rumphii*, and with patches of *Eranthemum* here and there beneath these. The more rocky portions of the coast like in the sea-face jungle-fence described above some other species that do not seem to care for sand or shingle, such as *Hibiscus tiliaceus*, *Tabernaemontana crispa*, *Desmodium polycarpon* and *Desmodium triquetrum*, *Briedelia*, *Derris uliginosa*, *Pluchea indica*, etc. Within the coco-nut zone on the flat land we meet with more *Gyrocarpus Jacquinii*, with the Andamanese Bullet-wood (*Mimusops littoralis*), various species of *Dipterocarpus*, *Milusa* sp., common, and some species of *Meliaceæ*; the climbing undergrowth in this tract

is very characteristic, more so than the trees, consisting of *Casalpinia Nuga*, *Capparis sepiaria*, and, very largely, of *Pisonia aculeata*. In the more muddy soil which occurs on the outskirts of the mangrove-swamps other shrubs and creepers occur; such as *Leea sambucina* with stilted roots like the mangroves, *Cynometra ramiflora*, *Hibiscus tiliaceus*, *Flagellaria indica*, *Mucuna gigantea*, remarkably common, *Sarcostigma edule*, *Plecosperrum andamanicum*, *Antitaxis calocarpa*, *Salacia prinoidea*, which extends also into the swamp proper, *Acrostichum scandens*, etc. Not infrequent in such situations, when there is no high forest overhead is *Vitex Negundo* which is particularly common on Little Coco. In this muddy tract the tall trees remain much the same as in the drier area just behind the beach. Further inward the vegetation is that characteristic of a true mangrove swamp, *Bruguiera*, *Ceriops*, *Rhizophora*, *Aegiceras*, *Avicennia*. The *Avicennia*, strangely, does not appear to be common in many of the creeks, though there is one creek, on the east side and near the south end of Great Coco, in which it is the prevailing tree; except indeed for a few *Bruguiera gymnorhiza* trees along the open channel of the creek, the whole swamp consists of *Avicennia officinalis* with thousands of its curious roots protruding through the mud and water as described already in a former paper (*J. A. S. B.* vol. lix, p. 272); considering the situation and loose structure of these roots, which are of the consistence of *solah*-pith, there seems every possibility that they are concerned in the process of transpiration; the large area covered by the roots of each tree must also afford great stability to a species which affects, as this one does, the situation of the mangroves without having their stilted roots. In this particular swamp each tree was loaded with the climbing form of *Salacia prinoidea* and, as the latter happened to be in flower at the time of the visit, the fœtid nature of the atmosphere experienced may be imagined.

Between the headlands, in most cases, a choked-up creek is to be found; generally this extends but a short way into the jungle, though sometimes it winds about on the level ground for a considerable distance as a mangrove-swamp. In two places the creeks on Great Coco are apparently open at all times to the tide; the chief creek is that which debouches at the north end of the island. There are no open creeks in the other two islands, though at the south-west corner of Little Coco what has been a creek of considerable extent is now converted into a large lagoon by a broad bank of sand having been blown and beaten up by the south-west monsoon into a firm embankment across its former outlet.

On the ridges the trees are much the same, as to species, as on the lower ground, except that the *Milusa* which is common below is scarce



there, and the *Gyrocarpus* is rather uncommon. The *Mimusops* too, is not so abundant on the drier ground. The *Pandanus*, however, especially on the western side of the islands, ascends to the tops of the ridges and along with the *Capparis sepiaria* occurs *Capparis oxyphylla* (*C. tenera*, var.), the other common creepers being *Lygodium flexuosum*, *Abrus precatorius*, *Mezoneuron enneaphyllum*, *Mucuna pruriens*, *Thunbergia laurifolia*, *Dioscorea* (two species), *Calamus* (two species) exceedingly abundant and making an almost impassable cane-brake especially on the crests of the ridges; *Pæderia fetida* is another common creeper, as also is *Modecca cordifolia*. The jungle with which these are associated contains, besides the shrubs met with on the lower ground, thickets of *Cyclostemon assamicus* and other Euphorbiaceous shrubs, *Alsodeia bengalensis*, *Glyptopetalum calocarpum*, *Grewia* (two species), *Diplospora singularis*, *Ficus* (several species), etc. On one hill, in Great Coco, there is a limited patch of bamboo-jungle, the species being a *Dendrocalamus*, probably a variety of *D. Strictus*. This species also occurs on Table Island, where flowering specimens were obtained, and at first there seemed to be room for doubt as to whether it might not have been introduced on the lighthouse-island, though certainly it only occurs there in the untouched jungle and no examples exist in the clearing. The presence of the same species, however, in quantity, in the interior of Great Coco, on a hill which it is hardly extravagant to suppose had not been before ascended by any one, may be held to dispose finally of the doubt. Among the features of the jungle on exposed sea-slopes that are not grass-clad must be noted the presence in quantity, besides the other creepers found on the ridges, of *Ipomœa palmata*, *Ipomœa grandiflora* and *Convolvulus parviflorus*, the latter a particularly characteristic species on the west coast. The herbaceous undergrowth consists of *Oplismenus compositus*, *Cyperus elegans*, and a few other sedges and grasses in local patches or as stray examples; in places also occur patches of *Alocasia fornicata*, *Calanthe* sp. (apparently *C. veratrifolia*), *Dracœna spicata*, *Desmodium laxiflorum*; in one place nearly in the centre of the island, some plants of *Urena lobata* (this species does not occur in the clearings of either island and cannot here be looked upon as a weed introduced by human agency); in the drier parts considerable quantities of *Acrostichum appendiculatum*; along the sides of dry torrents a good deal of *Adiantum lunulatum*; and in one or two damp, flat spots *Ceratopteris thalictroides*.

On Table Island the west side has been artificially cleared and it is impossible to say that it ever has been jungle-covered, but several of the headlands on the west side of the Great Coco, as has already been mentioned, have naturally bare grassy slopes. There are none of these,

however, on the Little Coco. The principal grass on these slopes, and throughout the two clearings as well, is the very uninviting *Andropogon contortus*, mixed with a small amount of *Ischæmum ciliare*; besides these there is some *Cyperus polystachyus*, and in the clearings of both islands *Eleusine indica* in tufts, with here and there a little *Panicum colonum*. In Table Island, though not in Great Coco, *Eleusine ægyptiaca* and *Panicum Helopus* have also become established. In this connection it should be mentioned that *Thuarea sarmentosa*, which is the common sward-grass under the coco-nut trees of Great Coco, is very rare in Little Coco; the only spot where the coco-nut zone is there of any width has *Ischæmum muticum* growing throughout it in abundance; in Great Coco *Ischæmum muticum* is rare.

On the low ground the epiphytes in the taller trees are two species of *Hoya*, *Scindapsus officinalis*, *Dendrobium secundum* (the only common light-loving orchid, which is particularly common on trees of *Heritiera littoralis*, etc., about the mouths of creeks), *Davallia solida*, *Polypodium* (*Niphobolus*) *adnascens*, and *Polypodium quercifolium*. There is a great absence of epiphytes from the trees growing in the interior, the ferns mentioned are in particular confined to the trees nearest the sea. In the muddy ground behind mangrove-swamps there are on the stems of *Cynometra* and other trees, great numbers of an orchid that proves, on having been flowered in the Calcutta garden, to be a *Dorites* with violet flowers; apparently, however, it is only a variety of *D. Wightii*.

Perhaps a better idea of the vegetation of the islands may be obtained if extracts from the writer's notes, enumerating the species met with in particular localities, be given. Of these only a few are selected, illustrative, as far as possible, of different kinds of soil and of diverse situations. From these it will be seen that any attempt to divide the forest into distinct zones and regions is attended with difficulty, since the various forests—*Mangrove*, *Beach*, *Mud-flat*, and *Dry-ridge* jungles—merge into each other on every hand.

In crossing the island on the drier level ground near the south end of the island one finds after the belt of coco-nuts, which is there about 100 yards wide on the western side, a jungle at first not very dense of *Canarium commune*; *Aglæa andamanica*; *Miliusa* sp.; *Gyrocarpus Jacquinii*, very common; *Mimusops littoralis*, the most common tree, with often great masses of *Hoya*, and near the sea with *Polypodium quercifolium* as epiphytes—all the *Mimusops* here is uniformly dying back in the topmost branches; *Bombax* sp., looking much more like *B. malabaricum* as to leaves than like the Andaman species identified by Kurz with *B. insigne*; *Dracontomelum sylvestre*; *Spondias mangifera*; *Semecarpus heterophylla*; *Albizia procera*; *Dipterocarpus* sp.; *Sterculia alata*; *Erio-*

*dendron anfractuosum*, etc. Under the *Cocos nucifera* on the sandy soil a sward of *Thuarea sarmentosa* with patches of *Ipomœa biloba* and with a quantity of *Eranthemum succifolium*; further inland there is a dense undergrowth of *Glycosmis pentaphylla*; *Ardisia humilis*; *Ficus brevicuspis* and *Ficus Dæmonum*; *Alsodeia bengalensis*; *Glyptopetalum calocarpum*; *Cyclostemon assamicus*; etc.—covered with a mass of *Pisonia aculeata*; *Cæsalpinia Nuga*; *Capparis sepiaria*; *Mucuna gigantea*, less common here than on muddy soil; *Calamus* sp., not very common; *Sarcostigma edule*; *Antilaxis calocarpa*; *Derris scandens*; *Thunbergia laurifolia*; *Dioscorea*, two sp.; *Vitis pedata*, very common; *Acacia rubricaulis*, often. Of sub-herbaceous plants may be mentioned *Dracæna spicata*, it is, however, less common on level ground than on the ridges. Further on were met with *Cynometra ramiflora*, with occasionally *Dorites Wightii* epiphytal, but less commonly so than where the soil is moist and muddy; considerable quantities of *Leea sambucina*; *Sterculia villosa*, as a small tree; *Stephegyne diversifolia*, though rarely; *Artocarpus Gomeziana*; *Terminalia bialata*; some *Siphonodon celastreus*; *Oroxylum indicum*; and, as the opposite side of the island is approached, *Croton sublyratus*; *Hernandia peltata*; *Sterculia rubiginosa*; *Terminalia Catappa*; *Erythrina indica*; and the *Pandanus* sea-fence. Just before reaching this coast-zone a single example of a stemless palm (*Livistona* sp.?) was met with; another example of this was obtained on the hill where the 1889 encampment was made at the north-east corner of the island. In cutting a path across the island at another point a level sandy tract was reached on which for several hundred yards grew nothing except young *Gyrocarpus Jacquinii*.

Crossing at a point where a ridge had to be passed it was found that much of the flat land behind the coco-nut zone was taken up with a jungle of *Gyrocarpus Jacquinii*, *Macaranga Tanarius* and *Mallotus andamanicus* to the exclusion of other species; but even as far as the base of the ridge many fruits of *Cocos nucifera* that had been floated inland during the rainy season, when the whole of this level tract is evidently water-covered, are germinating freely and some coco-nut trees that have reached the light have begun to bear. On the ridge itself a dense jungle prevails, much matted, especially along the crest, with creepers; the chief of these is *Thunbergia laurifolia*, the others being *Dioscorea* sp.; *Capparis sepiaria* and *Capparis tenera*; *Derris uliginosa*; *Anodendron paniculatum*; *Abrus precatorius* and *A. pulchellus*; *Calamus*; *Pædiria fœtida*; *Modecca*; *Trichosanthes palmata*; *Porana spectabilis*; a little further along this ridge the west side and the flat land at its base was found to be a dense thicket of *Caryota sobolifera*; the herbaceous undergrowth was remarkably sparse and consisted of a few plants of *Zingiber* sp.; some patches of *Alocasia*, and a few patches of *Oplis-*

*menus*. The eastern side of this ridge had no flat land between it and the sea and was rather more open, the tall trees and creepers were much as on the west side, with the addition of *Argyreia tiliaefolia* and *A. Hookeri*; large masses of *Erycibe paniculata*, which is here always a heavy climber and not shrubby; and among the undergrowth with the addition of *Ocaxylon* sp.; *Corypha* sp.; and near the shore *Blachia andamanica*; *Pluchea indica*; *Onesmone javanica*. On bare isolated rocks lying well out on the reefs, and never covered completely by the tide, the species found are always *Fimbristylis* sp.; *Cyperus pennatus*; and *Bærrhaavia repens*. The same species also occur on bare rocky patches of the coast all round the island but especially on the west coast. Other species associated with these in such situations are *Desmodium polycarpon*; *D. triquetrum*; *Blumea virens*; *Vernonia divergens*; *V. cinerea*; *Pluchea indica*, etc.

The isthmus uniting the outlying peninsula at the north-east corner with the main island has, mixed with the coco-nut trees occurring there, a sparse forest of *Mimusops* and *Dipterocarpus*, with an undergrowth towards the north coast almost exclusively of *Macaranga Tanarius*, towards the south almost entirely of *Dodonæa viscosa*, though here and there on hummocks of soil as opposed to sand, are other trees, like *Oroxylum indicum*; *Heterophragma adenophyllum*, etc. Among the herbaceous species here the most noteworthy is *Anisomeles ovata*, the only *Labiata* on the islands, which is, however, at this particular spot, very plentiful. On the coast of the north-east peninsula *Physalis minima* is a common species, it occurs, however, in similar situations here and there on both the Great and the Little Coco; on the slope above *Strobilanthes phyllostachyus* is gregarious and plentiful, as it likewise is at the north end of Little Coco in a similar situation.

As an example of the vegetation of level ground, where the soil is shingle instead of sand, the north end of Jerry island may be described. Here on the beach is a dense thicket of *Pemphis acidula*; behind this, a few examples of *Pandanus odoratissimus*; many *Scaevola Kœnigii*; some *Tournefortia argentea* and *Sophora tomentosa* bushes; many coco-nut trees; much *Cæsalpinia Bonducella*. Behind this sea-fence the shingle is covered with a mass of *Ipomœa biloba*, a striking contrast to what occurs at the north-east corner of the island where the shingle has *I. denticulata* only. The trees on this shingle are *Terminalia Catappa*, *Cocos nucifera*, *Ardisia humilis*, *Ixora brunnescens*, *Guettarda speciosa*, *Macaranga Tanarius*, *Mimusops littoralis*, *Gyrocarpus Jacquini*, *Hernandia peltata*. Besides the *Ipomœa* the only herbaceous vegetation consisted of a few fruiting *Amorphophalli*; the tubers of these brought to Calcutta have since sent up bulbiferous leaves that shew the species to be nearly

related to, but probably quite distinguishable from, *A. bulbifer* and *A. tuberculiger*, the two species hitherto known which exhibit this character. The east side of this island has *outside* the *Pandanus* fence, which is there about three times as broad and thick as on the west, a belt of *Thespesia populnea* and *Guetardia speciosa*, with patches of *Pemphis acidula* and *Olerodendron inerme*, and some trees of *Cordia subcordata* and *Champereia Griffithiana* as well as a few thickets of *Vitex Negundo* and *Desmodium umbellatum*.

The sandy isolated spit on the reef between Great Coco and Jerry Island is not covered even by spring-tides—it is about 70 feet long from north to south by some 30 feet across, and at the time of the writer's visit there could be counted on it (mostly near the east side, and towards the south end) about a dozen germinating coco-nuts; three seedling *Hibiscus tiliaceus*, a seedling *Thespesia*, some seedlings of *Gyrocarpus*, four seedling *Mucuna*, two seedling *Erythrina*, six seedling *Carapa moluccensis*, one seedling *Barringtonia speciosa*, one seedling *Entada scandens*, some young *Ipomoea biloba*, and one young *Cynometra*, with two or three other species not recognised.

In general features Little Coco so greatly resembles the other islands that it is unnecessary to deal with it in detail. The chief feature is perhaps the great abundance of *Corypha elata* and *Siphonodon celastrineus*; still both species were met with, though sparingly, on the Great Coco.

Before concluding, however, this general account of the vegetation of the islands the two fresh water accumulations deserve to be more particularly noted. That on the Great Coco consists of a small lake in the narrow neck of land that joins the outlying north-eastern peninsula to the rest of the island. This lakelet is about 300 yards long and hardly 100 yards wide, with its longer diameter *across* the isthmus. Its depth is a little over 3 feet; it is uniformly deep from side to side and from end to end, with a hard, even bottom. At either end it is only separated from the sea by some 80 to 100 yards of shingle bank, and it seems difficult to understand why the water it contains does not ooze out, and how it is that it is unaffected by the adjacent salt water, since the bottom of the lake is lower than the point reached by the waves that beat up on the single beach, if not actually lower than the level of the highest tides. The bottom seems to be no more than the floor of what has formerly been a shallow bay on the fringing-reef, and the shingle banks which separate it at either end from the sea seem to be nothing more than the ultimate embankments that would result when the causeways connecting outlying islets with the main island are so enlarged by accretion as to cease to be covered by the tides. This postulates that the present out-

lying north-eastern peninsula had originally been detached from the main island and, being an islet of considerable width, that a causeway, ultimately becoming an embankment, has been thrown up by wave-action from each of the two adjacent bays. Soil washed down from the adjacent slopes during the rainy season has in the form of fine silt closed up the porous shingle banks at either end till these can now retain the fresh water within them and prevent the percolation of sea-water from without. To the east side of this lake there is a small flat meadow covered with *Kyllinga* and *Fimbristylis* along with some *Cyperus polystachyus* but very little grass. Whether this meadow was originally a naturally bare patch or is only part of the clearing made in connection with the abandoned settlement on the adjacent hill it is difficult to say. If, however, it was artificially cleared, it is unlike the rest of the clearing in this, that no woody jungle is reappearing in it now. At the time of our visit a number of snipe frequented the meadow. Close to the edge of the lake is a continuous belt of *Hygrophila quadrivalvis*; within this, and extending into the water, is a belt of *Polygonum* all round the margin of the lake; inside the *Polygonum* float large matted patches of *Panicum Myurus*. Here and there are patches *Limnanthemum indicum*; there is also a considerable quantity of *Nymphæa rubra*. The ordinary white *Nymphæa Lotus*, so common in similar spots in the Andamans, is not present, a circumstance which inclines one to think that this red water-lily may have possibly been introduced during the attempt to settle in the island. The water is quite potable and apparently wholesome; neither *Ohara* nor *Zanichellia* is present, perhaps the water is rather deep for these.

Very different in many respects is the lagoon on Little Coco which is simply a mangrove creek that has been banked off from the sea by a small sand-dune having been thrown up across its mouth. It is not more than  $1\frac{1}{2}$ –2 feet deep anywhere, with also a level but at the same time a softer bottom than the Great Coco lake, and this bottom is covered uniformly throughout by a meadow of *Ohara* mixed with *Zanichellia*. Here the water, though perhaps potable on an emergency, and though used by native craft that call in for it, is slightly brackish, and the lake is fringed throughout by *Bruguiera*, *Lumnitzera*, *Ceriops*, *Avicennia*, etc., while clumps of similar mangrove trees occur throughout it. Its area is considerably greater than that of the Great Coco lake, for it is about a quarter of a mile long and a furlong across at the widest part; it was haunted at the time of our visit by teal. Here, curiously enough, *Panicum Myurus* does not occur, its place being taken by *Paspalum scrobiculatum* which floats in great patches at its south-western corner. There is no *Limnanthemum* and the *Nymphæa*

present is, as in the Andamans in such situations, the common *N. Lotus* and not, as in the Great Coco, the red-flowered variety. On the banks and extending into the water are considerable beds of *Scirpus subulatus* which does not occur in the other lake. Here on the other hand there is neither *Polygonum* nor *Hygrophila* present.

Beyond the coco-nuts the vegetable products of the island can hardly be very highly assessed. *Mimusops littoralis* (Andamanese Bullet-wood) is common and so is *Lagerstroemia hypoleuca* (Andamanese Pyen-ma); *Pterocarpus indicus* (Padouk) is rare however; and even of second- or third-rate timber trees such as *Diospyros Kurzii* (Zebra-wood); *Dipterocarpus* sp. (Wood-oil trees); *Heritiera* (Sundri); there is no great quantity; the only bamboo found (*Dendrocalamus strictus* VAR ?) is not very valuable and is not abundant; while the only abundant natural grass (*Andropogon contortus*) is so uninviting that the cattle on the island prefer eating *Pandanus* leaves to grazing it.

In the subjoined list of the species obtained during the two visits (which must not, however, be considered complete, though it may safely be assumed to be representative of the vegetation of the islands), it will be seen that a number of species are undetermined. As a matter of fact they are probably mostly species hitherto undescribed, but owing to the shortness of time at the writer's disposal, and owing to both the visits being at the same season of the year, it was impossible to obtain complete material of these, and it has therefore been impossible to prepare for them specific descriptions. In some cases roots or seeds of these have been brought to Calcutta and are now in cultivation there, so that their identification will, it is hoped, only be a matter of time.

In presenting this list the writer wishes to acknowledge much kind assistance received by him in its preparation; as regards *Phanerogams*, from his friends Mr. W. B. Hemsley, F. R. S., who has kindly compared a number of the more critical specimens at Kew; Mr. J. F. Duthie, F. L. S., who kindly assisted him in naming the grasses, and Mr. J. S. Gamble, F. L. S., who examined the solitary bamboo; and as regards *Cryptogams*, from Dr. G. King, F. R. S., who kindly assisted him in determining the *Ferns*; Mr. G. Massee, F. L. S., who, through the good offices of Mr. Hemsley, kindly named the *Fungi* and supplied the description of a new species of *Xylaria*; and Mr. G. R. Milne Murray, F. L. S., who, through the intervention of Dr. King, most kindly examined the *Algae*.

The list is followed by an analysis indicating its systematic, its physical, and its phytogeographic nature.

§ § LIST OF PLANTS COLLECTED IN THE GREAT COCO, LITTLE COCO AND  
TABLE ISLAND.

PHANEROGAMÆ.

THALAMIFLORE.

ANONACEÆ.

1. *MILIOUSA* sp.

Great Coco; Little Coco; very common in both islands.

The specimens obtained are in fruit only; the leaves are glabrous but otherwise are much like those of *M. Roxburghiana*; the fruits are very like those of *M. macrocarpa*.

MENISPERMACEÆ.

2. *CYCLEA PELTATA* H. f. and T.

Great Coco; common.

Burma, Nicobars. Not previously recorded from the Andaman group.

3. *ANTITAXIS CALOCARPA* Kurz.

Great Coco; common.

Andamans, Nicobars.

NYMPHÆACEÆ.

4. *NYMPHÆA LOTUS* Linn.

Great Coco; plentiful in the small lake at the north-east corner of the island—only the red flowered form (*N. rubra* Roxb.). Little Coco; sparingly in the lake at the south-west corner of the island—only the white form (*N. Lotus* Linn.).

This species is not included in any Andamans list and Kurz (*Report on the Vegetation of the Andamans*, p. 15) comments on the absence of NYMPHÆACEÆ. As a matter of fact this species does occur in the Andamans; as does *Barclaya longifolia*. *Nymphæa Lotus* is very plentiful everywhere about the settlement at Port Blair, and in one arm of a creek that had been shut off from the tide by a bank of earth only three months before, the writer in December 1890 found hundreds of seedling plants already springing up. The lake in which it occurs on Little Coco is only a mangrove creek naturally closed from the sea by a sand-bank and the water is still slightly brackish; the vegetation around consists of *Bruguiera*, *Lumnitzera*, *Ceriops*, *Avicennia*, and other mangrove swamp species.



## CAPPARIDÆ.

5. *CAPPARIS SEPIARIA* Linn. *var. GRANDIFOLIA* Kurz Mss. ex Prain, Jour. As. Soc., Beng., lix, Pt. 2, p. 275.

Table Island; Great Coco; Little Coco. Very common everywhere in the group, both on ridges and flat land.

Diamond Island (Arracan); Andamans; Java; Bali; Madura.

6. *CAPPARIS TENERA* Dalz. *var. LATIFOLIA* H. f. and T. (*C. ozyphylla* Wall.)

Table Island; Great Coco; Little Coco. Very common everywhere in the group, but only on ridges.

Tenasserim; Andamans (Middle Island and South Island).

## VIOLACEÆ.

7. *ALSODEIA BENGALENSIS* Wall.

Table Island; Great Coco; Little Coco. One of the commonest undershrubs in the group.

Silhet, rare; Martaban, frequent; Andamans, very common everywhere; Nicobars, very rare.

## GUTTIFERÆ.

8. *GARCINIA* ? sp.

Great Coco.

An altogether doubtful plant represented by one leaf specimen among the plants collected by Mr. Kurz in 1866; nothing resembling it was met with in 1889 or 1890. Mr. Kurz did not himself collect in Great Coco. A deputation that visited the island while he was at Port Blair brought him a few specimens; there may even be some confusion as to the locality—the deputation visited Narcondam and elsewhere as well as the Cocos.

9. *CALOPHYLLUM INOPHYLLUM* Linn.

Little Coco. In beach-forests on shingle behind the sea-face vegetation, not common.

Shores of India, Andamans, Nicobars, Burma, Malaya, Polynesia, Australia, and E. African islands.

## DIPTEROCARPEÆ.

10. *DIPTEROCARPUS PILOSUS* Roxb. ?

Great Coco; eastern coast, inland from Ford Bay, common. Only leaf specimens obtained and it is not impossible that they may belong to *D. Griffithii*, Miq.

11. *DIPTEROCARPUS ALATUS* Roxb.

Great Coco ; common. Little Coco ; infrequent.

Chittagong, Burma, Tenasserim, Andamans.

## MALVACEÆ.

12. *SIDA ACUTA* Burm.

Table Island ; cleared hillsides near lighthouse.

A cosmopolitan tropical weed.

13. *URENA LOBATA* Linn.

Great Coco ; in one spot only, in interior of island.

A cosmopolitan tropical weed, introduction in this case may be attributed to bird agency. It hardly seemed to be indigenous as there were where it was gathered only a few plants. Yet human agency appears impossible : the species is not present at the north-east of Great Coco where once a small clearing was made, nor on Table Island where there is now a large clearing. It does not seem to be present in the Little Coco.

Cosmopolitan in the tropics.

14. *HIBISCUS SABDARIFFA* Linn.

Great Coco only ; as if spontaneous in the small clearing ; one of the few remains of a garden that existed during the short time an attempt was made to settle in the island ; the few plants seemed unhealthy.

Cultivated in the tropics.

15. *HIBISCUS ABELMOSCHUS* Linn.

Table Island only ; common throughout the clearing, escaped from cultivation.

Cosmopolitan in the tropics.

16. *HIBISCUS TILIACEUS* Linn.

Table Island ; Great Coco ; Little Coco ; common, especially on the western coast, also plentiful at times in muddy flats behind mangrove swamps. A stunted almost glabrous form occurs on coral-shingle on Jerry Island.

Littoral species, cosmopolitan in the tropics.

17. *THESPESIA POPULNEA* Corr.

Very common on all the islands.

Littoral species on all tropical coasts in eastern hemisphere, introduced into West Indies.

18. *BOMBAX INSIGNE* Wall. ? *vars.*—??There are two forms of *Bombax* present in the islands :—

1. A tree with armed trunk and branches ; leaflets about 6, entire, narrowly lanceolate 5-8 inches long, 1-1½ inches wide, gradually tapering to both ends almost sessile, stamens numerous. This is com-

mon in all the islands, and if the writer is correct in considering the character of armed or unarmed trunk a trivial one, is the common *Bombax* in S. Andaman. The leaves suit exactly, and though in S. Andaman the trunk of old tall trees is smooth, young saplings are armed, as are the ultimate branchlets even of old trees. The leaves are unlike any of the Indian or Burmese gatherings either of *Bombax malabaricum* or of *Bombax insigne*.

2. A tree with unarmed trunk and branches, leaflets about 6, entire, obovate, acuminate 9–11 inches long,  $2\frac{1}{2}$ –3 inches wide, gradually tapering into petiolules  $\frac{1}{2}$ – $\frac{3}{4}$  inches long, stamens numerous. This was obtained only in Little Coco, it occurs in South Andaman also, for there are specimens at Calcutta, obtained by Mr. Kurz at Port Monat on the west coast. It does not at all resemble as to leaves of the other form nor does it resemble the leaves of Wallich's type specimen of *B. insigne*. But its leaves precisely resemble those of *Wall. Cat.* 1840/4 (from Taong Doun, Burma), which was issued as *B. malabaricum* var. *albiflorum*, Wall. The number of stamens makes it impossible to refer the Andaman plant at least to *B. malabaricum*.

In South Andaman both forms have the leaves glaucous beneath; in the Cocos neither form has; so that this character perhaps cannot be held as valid. Mr. Kurz did not consider the two Andamans forms separable from each other, and in one place he referred them to *B. malabaricum*, but afterwards, on account of the staminal character, united them to *B. insigne*. He has, however, left a manuscript name "*B. heterophyllum*," which proves both that he had noted the existence of the two kinds of foliage and that he could not separate the plants exhibiting them from each other.

It should be noted that the convicts and others at Port Blair distinguish two kinds of "Semul" or "Cotton-tree." The distinction does not, however, apply to the two forms referred to above, but to these two taken together and to the following species.

Both islands.

South Andaman. Burma?

19. *ERIODENDRON ANFRACTUOSUM* DC.

Both islands, common.

India, Burma, Malaya, Africa, and America.

## STERCULIACEÆ.

20. *STERCULIA VILLOSA* Roxb.

Great Coco; Little Coco.

India.

21. *STERCULIA RUBIGINOSA* Vent. *var. GLABRESCENS* King.  
Great Coco.  
A variety restricted to the Andamans and Nicobars.
22. *STERCULIA PARVIFLORA* Roxb.  
Little Coco; only leaf specimens which, however, agree with some from Penang.
23. *STERCULIA ALATA* Roxb.  
Both islands, frequent.  
India, Burma, Malaya.
24. *STERCULIA COLORATA* Roxb.  
Great Coco.  
India, Burma, Malay Archipelago.
25. *STERCULIA CAMPANULATA* Wall.  
Little Coco.  
Burma, Andamans, Java.
26. *HERITIERA LITTORALIS* Dryand.  
Great Coco; Little Coco; common in the creeks.  
Littoral species on tropical coasts of eastern hemisphere.
27. *BUETTNERIA ANDAMANENSIS* Kurz.  
Little Coco; common.  
Andamans, Tonasserim.

## TILIACEÆ.

28. *BERRYA AMMONILLA* Roxb.  
Little Coco, frequent.  
India, Ceylon, Burma, Andamans.
29. *GREWIA LÆVIGATA* Vahl.  
In all the islands, common.  
India, Burma, Malaya, Australia, Africa.
30. *GREWIA CALOPHYLLA* Kurz.  
Little Coco, common.  
Andamans.
31. *GREWIA MICROCOS* Linn.  
Great Coco, infrequent.  
India, Burma, China, Malaya.

## DISCIFLOREÆ.

## RUTACEÆ.

32. *GLYCOSMIS PENTAPHYLLA* Corr.  
In all the Islands; both the arboreous and the shrubby form extremely common.  
Throughout India, Indo-China, and Malaya.

## BURSERACEÆ.

33. *GABUGA PINNATA* Roxb.  
Great Coco; common.  
India, Burma, Malaya.
34. *CANARIUM EUPHYLLUM* Kurz.  
Great Coco; very common.  
Andamans.

## MELIACEÆ.

35. *AGLAIA ANDAMANICA* Hiern.  
Great Coco, Little Coco; common. Flowers sweet-smelling.  
Andamans.
36. *AMOORA ROHITUKA* W. & A.  
Great Coco; common.  
India, Burma, Malaya.
37. *CARAPA MOLUCCENSIS* Lamk.  
Great Coco; rather uncommon. The form with obtuse leaves (*C. obovata* Bl.) only occasional in the creeks, but very frequent germinating along the beaches of all the islands. The form with ovate cordate acuminate leaves in two or three places on rocky parts of the eastern coast. Little Coco; in one place only (form = *C. obovata* Bl.)
38. *CHICKRASSIA TABULARIS* A. Juss. ?  
Great Coco; common. In leaf only, but evidently identical with the tree identified with this species by Mr. Kurz in *Reg. Veg. Andam.*, p. 33.

## OLACINEÆ.

39. *CANSJERA RHEEDII* Gmel.  
Great Coco; a common climber.  
India, Burma, Malaya, N. Australia, S. China.
40. *PHLEBOCALYMNA LOBBIANA* Mast.  
Little Coco.  
Tenasserim and Martaban.
41. *SARCOSTIGMA WALLICHII* Baill. (*S. edule* Kurz.)  
Great Coco; rather common.  
Andamans. Mr. Kurz has in the Calcutta herbarium suggested the reduction of his own species to *S. Wallichii* Baill., a plant from the Salween valley, nor is there any character by which the two can be distinguished.

## CELASTRINEÆ.

42. *GLYPTOPETALUM CALOCARPUM* Prain, Jour. As. Soc. Beng., lx, 2, 209  
—*Euonymus calocarpus* Kurz.

Common in all the islands, also reported from Narcondam (leaf specimens only, and the locality perhaps a mistake—the writer could not find the shrub in Narcondam). Very nearly related to *G. zeylanicum* Thwaites, from Ceylon and S. India, but easily distinguished by its shorter racemes, smaller flowers and hardly foveolate petals. The fruits and seeds are exactly as in *G. zeylanicum*. In this the leaves are always entire.

43. *SALACIA PRINOIDES* DC.

Great Coco; in creeks, an extensive climbing shrub, associated with *Avicennia officinalis*.

India, Burma, Malaya, Philippines.

44. *SIPHONODON CELASTRINEUS* Griff.

Great Coco, occasional; Little Coco, very common. A considerable tree.

Pegu, Penang, Java.

### RHAMNEÆ.

45. *VENTILAGO CALYCVLATA* Tulasno.

Great Coco.

India, Burma, Malaya.

46. *ZIZYPHUS (ENOPLIA)* Mill.

Great Coco, not at all common.

India, Burma, Malaya, N. Australia.

47. *COLUBRINA ASIATICA* Brogn.

Little Coco; coast at north end of island.

India, Ceylon; Burma, Malaya; N. Australia; S. W. Africa.

### AMPELIDÆ.

48. *VITIS PENTAGONA* Roxb.

Table Island and Great Coco; common.

Chittagong, Arracan, Andamans.

49. *VITIS CARNOSA* Wall.

Common on all the islands.

India, Burma, Malaya.

50. *VITIS PEDATA* Wall.

Great Coco, and Little Coco; very common.

India, Burma, Malaya.

51. *LEEA SAMBUCINA* Willd.

Interior of all the islands, common.

India, Burma, Malaya.

52. *LEEA HIETA* Roxb.

Great Coco.

India, Burma, Malaya.

## SAPINDACEÆ.

53. *ERIOGLOSSUM EDULE* Blume.  
Both islands, on ridges, common.  
India, Burma, Malaya, North Australia.
54. *ALLOPHYLUS COBBE* Blume.  
Great and Little Coco; not uncommon along the western sea-face.  
India, Burma, Malaya.
55. *SAPINDUS DANURA* Voigt.  
Great Coco.  
Assam, Burma.
56. *POMETIA TOMENTOSA* Kurz.  
Great Coco, common.  
Indo-China, Andamans, Nicobars, Malaya, Ceylon.
57. *DODONÆA VISCOSA* Linn.  
Great Coco; a small tree very common at the north-east corner of the island.  
Cosmopolitan in the tropics.

## ANACARDIACEÆ.

58. *ODINA WODIER* Roxb.  
Great Coco.  
India, Ceylon; Burma, Tenasserim.
59. *PARISHIA INSIGNIS* Hook. f.  
Great Coco; in leaf only.  
Tenasserim, Andamans.
60. *SEMECARPUS SUBPANDURIFORMIS* Wall.  
Great Coco only, but there rather frequent near the eastern coast.  
Chittagong; Gamble. Arracan, in the Kolodyne valley, Kurz; on Boronga Island, Kurz. Originally this was known only from specimens grown in the Calcutta garden (introduced from Chittagong) distributed by Dr. Wallich (*Cat.* n. 987).
61. *SEMECARPUS HETEROPHYLLUS* Blume.  
Great Coco, interior, rather frequent; Little Coco, interior, extremely common.  
Pegu, Tenasserim; Andamans, Nicobars; Sumatra, Java.
62. *SPONDIAS MANGIFERA* Willd.  
Great Coco and Little Coco, very common in the interior of both islands; the fruits are yellow and extremely sour, but much eaten by the wild pigs (*Sus andamanensis*) which abound.  
Tropical Asia; Mr. Kurz found this in S. Andaman also.
63. *DRACONTOMELUM MANGIFERUM* Blume.  
Great and Little Coco, frequent: in leaf only.

Andamans, Nicobars; Malay Peninsula and Archipelago; Philippines and Fiji Islands.

### MORINGEÆ.

#### 64. *MORINGA PTERYGOSPERMA* Gaertn.

Great Coco; a few trees have been planted at the north-east corner of the island by the people of the attempted settlement; a large number of seedlings have already appeared though the introduction has been so recent.

India; indig. in North-West Himalaya, elsewhere cultivated in tropical countries.

### CALYCIFLOREÆ.

### CONNARACEÆ.

#### 65. *CONNARUS GIBBOSUS* Wall.

Great Coco.

Tenasserim, Malaya; Andamans.

### LEGUMINOSÆ.

#### 66. *CROTALARIA SERICEA* Retz.

Table Island; very common throughout the clearing; apparently introduced, as it was not found in Great Coco or Little Coco. This species does not seem to occur in the Andaman group proper; at Port Blair in S. Andaman *Crotalaria retusa* is the species that has been introduced and occupies similar localities.

India, Burma, Malaya.

#### 67. *DESMODIUM UMBELLATUM* DC.

In all the islands, very common on the coast.

India, Burma, Andamans, Malaya, Philippines, Polynesia, Mascarene islands.

#### 68. *DESMODIUM TRIQUETRUM* DC.

Table Island and Great Coco; very common on bare rocky slopes on west coast, occasional on higher ground in the interior; Little Coco, occasional in the interior.

India, Burma, Malaya, Andamans; Philippines; S. China.

#### 69. *DESMODIUM LAXIFLORUM* DC.

In all the islands, rather frequent on the higher ground in the interior.

India, Burma; Andamans, Nicobars; Malaya.

#### 70. *DESMODIUM POLYCARPUM* DC.

Table Island and Great Coco; very abundant on all the rocky slopes



on the western coasts. This species has been referred to (*Jour. As. Soc., Beng.*, lix, pt. 2, p. 251) as perhaps introduced into the Andamans, because Mr. Kurz did not meet with it in 1866 when he explored a part of the group. But from what the writer has been able to note since, he is convinced that the species is indigenous in the Andaman group.

East Africa; Tropical Asia; Malaya, Philippines; China, Japan; Polynesia.

71. *DESMODIUM TRIFLORUM* DC.

Table Island, in the lighthouse clearing on grassy slopes. There is a white- and a red-flowered variety and both are equally common.

Cosmopolitan in the tropics.

72. *ALYSICARPUS VAGINALIS* DC.

Great Coco, in the small clearing at the north-east corner of the island, probably introduced.

Tropical weed indigenous in eastern hemisphere; introduced in America.

73. *PHASEOLUS* sp.

Great Coco. Appearing as seedlings in the droppings of the half-wild cattle on a bare grassy hill-side in the south-west of the island, much frequented by these, were seen during the second visit to the island numerous examples of what appears to be a species of this genus. Each leaflet has in the centre a reniform white mark which ought to be distinctive, yet the writer cannot recall a variety which exhibits this. The origin of the seeds could not be traced, no *Phaseolus* was observed in the abandoned clearing in 1889, and unfortunately it was impossible to re-examine that locality in 1890.

74. *ABRUS PRECATORIUS* Linn.

Great Coco, common; Little Coco, very common.

Cosmopolitan in the tropics.

75. *ABRUS PULCHELLUS* Wall.

In all the islands, very common.

Africa, India, Burma, Malaya, Andamans.

76. *ERYTHRINA INDICA* Lamk.

In all the islands, in coast zone; not nearly so common as it is on Diamond Island at the mouth of the Bassein river.

India, Burma, Malaya; Andamans; Nicobars.

77. *MUCUNA GIGANTEA* DC.

Great and Little Coco; one of the commonest climbers on flat land in the interior behind the mangrove swamps.

India, Andamans; Malaya; Philippines; Polynesia.

78. *MUCUNA PRURIENS* DC.

Table Island, very common, interior jungle on ridges.

Cosmopolitan in the tropics.

79. *PUERRARIA CANDOLLEI* Graham.  
Little Coco, common.  
Pegu, Tenasserim.
80. *PUERRARIA PHASEOLOIDES* Benth. .  
Great Coco, common on the western coast.  
India, Burma, S. China, Malaya.
81. *CANAVALIA OBUSIFOLIA* DC. (*Dolichos lineatus* Thunbg.)  
In all the islands, one of the commonest climbers along the sea-face  
here as on the Burmese, the Andamans, Nicobars and Malay coasts.  
Cosmopolitan on tropical shores.
82. *VIGNA LUTEA* A. Gray. .  
Little Coco, very common on coasts both east and west ; Great Coco,  
rather rare.  
Martaban, Malaya ; Andamans, Nicobars.  
Cosmopolitan in tropics, but absent from India.
83. *PTEROCARPUS INDICUS* Willd.  
Great Coco, infrequent.  
India, Burma, Andamans, Malaya ; Philippines ; S. China.
84. *DERRIS SCANDENS* Benth.  
Great and Little Coco ; very common.  
India, Burma, Andamans, Malaya ; S. China, N. Australia.
85. *DERRIS SINUATA* Benth.  
Great Coco, extremely common on the eastern coast.  
Pegu, Tenasserim, Malay Peninsula ; Andamans, Malay islands ;  
Ceylon.
86. *DERRIS ULIGINOSA* Benth.  
Both islands, common, on rocky parts of the coast.  
India, Burma, Malaya, Africa, Australia, Polynesia.
87. *PONGAMIA GLABRA* Vent.  
In all the islands, a common tree in the coast zone and especially  
along the sides of mangrove creeks ; never seen climbing.  
India, Burma, Andamans, Malaya ; Polynesia ; N. Australia ;  
Seychelles.
88. *SOPHORA TOMENTOSA* Linn. .  
Great and Little Coco, west coast, but infrequent.  
Cosmopolitan on tropical sea-shores.
89. *MEZONEURON ENNEAPHYLLUM* W. & A.  
Great Coco, common on summits of interior ridges.  
Cachar, Chittagong ; Pegu, Tenasserim, Ceylon, Malay Archipelago.
90. *CESALPINIA BONDUCELLA* Flem.  
In all the islands, very common in the sea-face jungle along the  
beaches.  
Cosmopolitan in the tropics.

91. *CÆSALPINIA NUGA* Ait.

In all the islands; very common in the jungle on flat land behind beaches and mangrove-swamps.

India, Ceylon; Burma; Malaya; Philippines; N. Australia; S. China; Polynesia.

92. *TAMARINDUS INDICA* Linn.

Great Coco, a single large tree on west side of mouth of creek opening into Pollok Bay. This tree grows in a place where it could hardly have been planted; if planted where it grows it can hardly be imagined for what object the position was selected and the tree is obviously much older than the last attempt at settlement in the island. This bay is at certain seasons an anchorage for Burmese junks calling to obtain coco-nuts and the introduction of the tree is probably due to a tamarind fruit having been cast overboard from one of those junks and thrown up by the tide where the tree now grows.

Throughout the tropics, cultivated; perhaps indigenous in Africa.

93. *CYNOMETRA RAMIFLORA* Linn.

In all the islands; very common in flat, muddy lands behind mangrove swamps.

India, Ceylon; Burma, Andamans, Nicobars, Malaya; Philippines; N. Australia.

94. *ENTADA SCANDENS* Benth.

In all the islands, frequent; its seeds occur in all the shore-drifts and it was one of the species found germinating on a sandy spit (an incipient island) between Jerry Island and the south end of Great Coco.

Cosmopolitan in the tropics.

95. *ADENANTHERA PAVONINA* Benth.

Table Island and Great Coco, common.

India, Ceylon; Burma, Andamans, Malaya; Philippines; S. China.

96. *ACACIA CONCINNA* DC.

Great Coco, rather common.

India, Ceylon; Burma, Malaya; S. China.

97. *ACACIA PENNATA* Willd.

In all the islands, very common.

Africa; India, Ceylon; Burma, Andamans, Malaya.

98. *ALBIZZIA LEBBEK* Benth.

Great Coco.

Africa; India, Ceylon; Burma, Tenasserim, Malaya; Andamans; China; N. Australia.

99. *ALBIZZIA PROCERA* Benth.

In all the islands exceedingly common on the interior ridges; stunted and weatherbeaten where it approaches the west coast.

India, Burma, Malaya, Philippines, (not yet recorded from south Andaman).

### RHIZOPHOREÆ.

100. *RHIZOPHORA MUCRONATA* Lamk.  
Great and Little Coco, frequent in mangrove swamps.  
Tropical shores of Africa, Asia, and N. Australia.
101. *RHIZOPHORA CONJUGATA* Linn.  
Great Coco, common.  
Tropical shores of Asia, and Africa.
102. *CERIOPS CANDOLLEANA* Arn.  
Great Coco, common.  
Tropical shores of Eastern Hemisphere.
103. *CERIOPS ROXBURGHIANA* Arn.  
Great Coco, not common.  
Tropical shores of Eastern Hemisphere.
104. *BRUGUIERA GYMNORHIZA* Lamk. •

In all the islands, common. This is the chief constituent of the mangrove jungle in the group; it germinates very freely also along the sandy beaches though there it doubtless does not persist; it also germinates along the ridges of coral that are formed between the mainland and small outlying islets like Lascellos Island, Rat Island, Button, and others, and as the roots spread they help to collect the "drift" of the tides and shew how it is possible for the island to increase in size without postulating a general upheaval for the group. On bare rocky promontories on the west coast where long rocky ledges and reefs of loose boulders run many yards out to sea, numbers of seedlings also appear and though these spots are exposed to the full force of the south-west monsoon many of these resist the waves for at least several seasons; the only other constituent of the mangrove jungle that does this is *Avicennia*, many specimens of which though dwarf and weatherbeaten are evidently of considerable age. *Pemphis*, which also greatly affects such positions is not partial to mangrove swamps proper at all and was never seen along the creeks. In the small lake on Little Coco the water of which was potable though not good almost all the constituents of a mangrove swamp were growing freely.

Tropical shores of Eastern Hemisphere and Polynesia.

### COMBRETACEÆ.

105. *TERMINALIA CATAPPA* Linn. ••

In all the islands; one of the commonest trees on the shore and

not infrequent in the interior on flat lands, but not met with ascending the ridges. There is apparently no such species as *T. procera*.

Andamans, Malaya; planted elsewhere in the tropics.

106. *TERMINALIA BIALATA* Kurz.

Great Coco, frequent.

Burma, Tenasserim, Andamans.

107. *LUMNITZERACEMOSA* Willd.

Little Coco, very common among mangroves in the lagoon.

Tropical shores of Eastern Hemisphere and Polynesia.

108. *ILLIGERA CONYZADENIA* Meissn.

Great Coco; a rather common climber.

Tenasserim, Andamans.

109. *GYROCARPUS JACQUINI* Roxb.

In all the islands, probably the commonest species in the group.

Tropical sea-shores of the old world and Polynesia.

### MYRTACEÆ.

110. *BARRINGTONIA SPECIOSA* Forst.

In all the islands, very common.

Ceylon; Andamans, Nicobars; Malaya; Australia; Polynesia: on sea-shores.

111. *BARRINGTONIA RACEMOSA* Blume.

In all the islands, very common.

India, Ceylon; Burma, Malaya; Andamans, Nicobars; Polynesia: on sea-shores.

### MELASTOMACEÆ.

112. *MEMECYLON EDULE* Roxb.

Great Coco; east coast, on rocky promontory at south end of Ford Bay—only one tree seen.

Andamans, Malaya, Philippines. Mr. Kurz has a specimen from Great Coco also, only in leaf, and has it from S. Andaman in flower.

### LYTHRACEÆ.

113. *PEMPHIS ACIDULA* Forst.

In all the islands; very common, especially on the west coast on rocky or shingly promontories.

Tropical shores of Eastern Hemisphere.

114. *LAGERSTRÆMIA HYPOLEUCA* Kurz.

Great Coco, common in the interior.

\* Andamans.

115. *LAGERSTRÆMIA* sp.

Little Coco.; one tree only seen.

A tall straight tree, about 100 feet, leaves sessile, oblong-lanceolate 8 in. long,  $2\frac{1}{4}$ – $2\frac{3}{4}$  in. wide, thinly coriaceous, fruit  $\frac{1}{2}$  in., calyx woody, lobes spreading.

The leaves of this are unlike those of any Indian species; the fruit is very like that of *L. calyculata* Kurz, from Martaban, but the leaves are very different, being larger, much thinner, and perfectly glabrous. This, when flowers are found, will almost certainly prove a distinct species.

## PASSIFLOREÆ.

116. *MODECCA CORDIFOLIA* Blume (fide Masters).

Great Coco, common.

Andamans; the specimens are exactly like the common Andaman coast *Modecca* and the flowers appear not to differ from those of *M. cardiophylla* Mast.

117. *CARICA PAPAYA* Linn.

Great Coco, introduced but perfectly naturalised and already extending in an unbroken line among the coco-nuts on the east coast, from the north-east corner to within 3 miles of the south end of the island; one or two isolated specimens occur at the south-east corner evidently originating from fruits washed up by the sea. Half a mile from the south end on the west coast is another spot, well into the interior, where some trees occur—the result apparently of independent introduction as they occur near the remains of some huts used by coco-nut gatherers who visit the island at intervals.

Cultivated in warm countries; originally American.

## CUCURBITACEÆ.

118. *TRICHOSANTHES PALMATA* Roxb.

Little Coco; near north end of island.

India, Ceylon; Burma, Andamans; Malaya; N. Australia; China, Japan.

## FICOIDEÆ.

119. *SESUVIUM PORTULACASTRUM* Linn.

In all the islands; common on sandy beaches on the east coast.

All tropical and sub-tropical sea-shores.

## COROLLIFLORÆ.

## RUBIACEÆ.

120. *STEPHEGYNE DIVERSIFOLIA* Hook. f.  
In all the islands, extremely common.  
Chittagong, Burma, Tenasserim ; Philippines.
121. *MUSSÆNDA CALYCINA* Wall. (*M. macrophylla* forma distinctior).  
In all the islands very common. The calyx-teeth in these examples are  $\frac{3}{4}$  in. long and  $\frac{1}{4}$  in. broad.  
Pegu, Tenasserim, Andamans.
122. *WEBERA KURZII* Hook. f.  
Little Coco ; common in interior.  
Andamans.
123. *RANDIA LONGIFLORA* Lamk.  
Little Coco, common.  
Assam, Chittagong, Burma, Tenasserim, Malaya ; Andamans, Nicobars.
124. *DIPLOSPORA SINGULARIS* Korth.  
In all the islands, extremely common.  
Assam, Burma, Tenasserim ; Malaya. Not yet reported from other parts of the Andaman group.
125. *GUETTARDA SPECIOSA* Linn.  
Great Coco, east coast ; frequent.  
Cosmopolitan on tropical sea-shores.
126. *IXORA GRANDIFOLIA* Zoll. & Mor., var. *KURZEANA* Teys. & Binnend.  
In all the islands, common in the interior jungle ; a small straggling shrub.  
Nicobars. This is exactly like the type of Teysmann and Binnendyk's *I. Kurzeana*.
127. *IXORA BRUNNESCENS* Kurz.  
In all the islands ; very common along the beaches. A fine tree, often 60–80 feet ; extremely unlike the preceding.  
Andamans, Nicobars.
128. *IXORA CUNEIFOLIA* Roxb.  
Little Coco ; infrequent.  
Assam, Burma, Tenasserim.
129. *PAYETTA INDICA* Linn.  
In all the islands, very common.  
India ; Burma, Andamans ; Malaya ; S. China ; N. Australia.
130. *MORINDA CITRIFOLIA* Linn., *var. BRACTEATA* Roxb.  
In all the islands, exceedingly common along the coast.  
Laccadives ; Andamans ; Nicobars ; Sunderbuns ; Arracan.

131. *PSYCHOTRIA ADENOPHYLLA* Wight.  
Very common in all the islands.  
Assam, Pegu, Tenasserim; Andamans.
132. *PÆDERIA FÆTIDA* Linn. •  
Very common in all the islands.  
India, Burma, Malaya.

## COMPOSITÆ.

133. *VERNONIA CINEREA* Less. •  
Tablo Island, common in the clearing near the lighthouse; Great Coco, frequent in the small clearing at the north-east corner but also plentiful on bare rocks on the western sea-face of the island. Though probably an introduced plant in the two first situations, its appearance on the west coast, where it is extremely plentiful, indicates that it has also reached the island independently of human agency.  
Tropical Asia, Africa and America.
134. *VERNONIA DIVERGENS* Benth. •  
Great Coco; plentiful on rocky promontory at north end of island.  
India, Burma, Tenasserim.
135. *ADENOSTEMMA VISCOSUM* Forst.  
Great Coco, on the western coast and at the north end of the island.  
Cosmopolitan in the tropics.
136. *AGERATUM CONYZOIDES* Linn.  
Tablo Island, common in the clearing near the lighthouse.  
Cosmopolitan in the tropics; originally American.
137. *BLUMEA VIRENS* DC. •  
Great Coco, profuse on rocks on western sea-face; in one sheltered cove the stems were over 8 feet high.  
India, Burma, Tenasserim (Mergui, *Griffith*).
138. *PLUCHEA INDICA* Less.  
Great Coco, common on the coast.  
India, Burma, Malaya, China; sea-shores.
139. *WEDELIA SCANDENS* C. B. Clarke. •  
In all the islands, common in the sea-fence jungle, a rather brittle woody climber with stems 30—40 feet long.  
Tropical sea-shores of India, Burma, Malaya, Andamans and Nicobars.

## GOODENOVIÆ.

140. *SCÆVOLA KÆNIGH* Vahl. • •  
In all the islands, very common in the coast zone.  
India, Burma, Malaya, Australia, Polynesia; on sea-coasts.



## MYRSINEÆ.

141. *ARDISIA HUMILIS* Vahl.

In all the islands, common in the beach forest.

India, China, Malaya.

142. *ÆGICERAS MAJUS* Gaertn.

Great Coco: fruits seen in the sea-drifts on the coast; doubtless the species occurs frequently in the mangrove swamps, though no individual tree was met with.

Cosmopolitan on tropical sea-coasts.

## SAPOTACEÆ.

143. *MIMUSOPS LITTORALIS* Kurz.

In all the islands; next to *Gyrocarpus Jacquini*, this (the Andaman Bullet-wood) is the commonest tree in the group.

In Jerry Island, off the south end of Great Coco, and for about two miles along the coast at the south end of Great Coco, nearly every tree that has attained a height of 80 feet presents from the sea the appearance of being dead. Closer inspection, however, shews that in many (perhaps most) cases only the whole of the main branches are dead, while about their bases or along the main trunk numerous close bunches of small branches have appeared, the leaves of which keep the trees still alive. The same thing is apparent at the south-west corner of Little Coco but is less striking because less extensive.

Andamans, Nicobars.

## EBENACEÆ.

144. *DIOSPYROS KURZII* Hiern.

Little Coco; Great Coco, rare.

Andamans, Nicobars.

## APOCYNÆÆ.

145. *RAUWOLFIA SERPENTINA* Benth.

Great Coco, common.

India, Burma, Tenasserim, Java; not previously reported from the Andamans.

146. *CERBERA ODOLLAM*, Gaertn.

Great Coco, rare; in mangrove swamps.

India, Malaya, Andamans; China; Australia, Polynesia.

147. *OCHROSIA BORBONICA* Gmel.

Little Coco, common; in beach forests.

Andamans, Malaya, Seychelles, Mascarene Islands.

148. *TABERNÆMONTANA CRISPA* Roxb.

In all the islands, very common along the west coast.  
Andamans-Nicobars, Diamond Island (off Arracan coast).

149. *STROPHANTHUS WALLICHII* A. DC.

Great Coco; a large climber, in leaf only.  
India, Assam, Chittagong.

150. *ANODENDRON PANICULATUM* A. DC.

In all the islands.  
India, Burma, Malaya, Philippines.

151. *CHONEMORPHIA MACROPHYLLA* G. DON.

Little Coco, common.  
India, Andamans, Malaya.

## ASCLEPIADEÆ.

152. *SARCOLOBUS GLOBOSUS* Wall.

Great Coco and Little Coco; common in mangrove swamps.  
Sunderbuns, Tenasserim, Malay Peninsula; Nicobars.

153. *HOYA PARASITICA* Wall.

Great Coco.  
Assam, Khasia, Chittagong, Tenasserim, Malaya; Andamans.

154. *HOYA DIVERSIFOLIA* Blume.

In all the islands; extremely common.  
Burma, Malaya.

155. *DISCHIDIA NUMMULARIA* R. Br.

Little Coco; not common.  
Cachar, Chittagong, Tenasserim, Malaya, Andamans; Australia.

## GENTIANACEÆ.

156. *LIMNANTHEMUM INDICUM* Thwaites.

Great Coco; abundant in the small lake at the north-east corner of the island; not in the lake on Little Coco and not previously reported from the Andamans. The lake is adjacent to the small clearing, and the species may possibly be an introduced one in this locality.

Afghanistan; India, Burma, Malaya; Australia, Fiji; Mascarene islands.

## BORAGINÆÆ.

157. *CORDIA SUBCORDATA* Lamk.

Great Coco, a rather common tree in the beach-forests on the east coast.

Andamans, Malaya; Australia; Sandwich Islands.

158. *TOURNEFORTIA ARGENTEA* Linn. f.

Great Coco, very rare; Little Coco, extremely common on the western coast and in the beach-forests, where it often reaches a height of 35—40 feet with a trunk of sometimes a foot diameter.

Ceylon; Malaya, Andamans, Nicobars; Australia; Mauritius.

## CONVOLVULACEÆ.

159. *ERYCIBE PANICULATA* Roxb.

Great Coco, very common in interior.

India, Burma, Tenasserim; Malaya; Andamans, Nicobars; Australia.

160. *ARGYREIA TILIÆFOLIA* Wight.

Great Coco; common on the coasts.

India; Andamans, Malaya; Philipinos; near the sea.

161. *ARGYREIA HOOKERI* Clarke.

In all the islands, common.

Sikkim, Bhutan, Assam, Martaban.

162. *ARGYREIA LANCEOLATA* Choisy.

Great Coco: exactly = *Wall. Cat.* 1395.

Tenasserim, Andamans.

163. *LETTSOMIA PEGUENSIS* Clarke.

Little Coco.

Pegu, Tenasserim, Andamans.

164. *IPOMÆA GRANDIFLORA* Lamk.

In all the islands, very abundant on the coasts.

East Africa; India, Burma, Malaya, Andamans; Australia, Polynesia; introduced in America.

165. *IPOMÆA COCCINEA* Linn.

Table Island, rampant in the jungle near the lighthouse clearing; escape from the light-keeper's garden.

Native of America; cult., and a frequent escape, in tropical Asia.

166. *IPOMÆA BATATAS* Lamk.

Table Island, cultivated in the lighthouse garden.

Native of America; cult., in the tropics generally.

167. *IPOMÆA DIGITATA* Linn.

Great Coco, on the west coast, occasional.

Cosmopolitan in the tropics.

168. *IPOMÆA DENTICULATA* Choisy.

Great Coco, very plentiful at north end of island, but almost altogether restricted to the coral-shingle; at south end of island and on Little Coco, exceedingly uncommon.

Seychelles; Ceylon; Malaya, Andamans and Nicobars; Australia, Polynesia.

169. *IPOMÆA TURPETHUM* R. Br.

Both islands, not uncommon.

India, Burma; Malaya; Australia, Polynesia; Mauritius, Seychelles.

170. *IPOMÆA BILOBA* Forsk.

In all the islands, very common; affects principally the sandy beaches; in Jerry Island, however, grows on the shingle and occurs under rather dense jungle, from side to side of that island, at its north end.

Cosmopolitan on tropical sea-shores.

171. *CONVOLVULUS PARVIFLORUS* Vahl.

In all the islands; very common in the jungle along the western sea-face.

Africa; India, Burma, Malaya, Andamans; Australia.

172. *PORANA SPECTABILIS* Kuntz.

Great Coco.

Tenasserim, Andamans.

### SOLANACEÆ.

173. *SOLANUM MELONGENA* Linn.

Table Island, cultivated in the light-house garden; Great Coco, plentiful and quite naturalised all over the clearing at the north-east corner of the island; remains of the garden.

Cult. in all warm countries.

174. *PHYSALIS MINIMA* Linn.

Great Coco; abundant on rocky parts of the coast just above limits reached by spray during storms, on east, north and west coasts; Little Coco, on rocks in similar situations at north end of island.

Cosmopolitan in the tropics.

175. *CAPRICUM MINIMUM* Roxb.

Table Island, in clearing, occasional, escape from the light-keeper's garden; Great Coco, throughout the clearing very abundant; unlike *Solanum Melongena* this is not confined to the clearing but is extending into the jungle much as *Carica Pappaya* is.

India and Malaya; cultivated and frequent as an escape.

### SCROPHULARINEÆ.

176. *SCOPARIA DULCIS* Linn.

Table Island and Great Coco; abundant in the clearings on both islands; introduced.

An American weed, now cosmopolitan in the tropics.

## BIGNONIACEÆ.

177. *Oroxylum indicum* Vent.

Little Coco, very plentiful at north-east corner of the island ; Great Coco, rare.

India, Ceylon ; Indo-China, Andamans ; Malaya.

178. *Heteroplagma adenophyllum* Seem.

In all the islands, very common.

Assam and Eastern Bengal, Burma, Tenasserim ; Andamans.

## ACANTHACEÆ.

179. *Thunbergia laurifolia* Lindl.

In all the islands, very common.

Arracan, Tenasserim, Malaya ; Andamans.

180. *Hygrophila quadrivalvis* T. And.

Great Coco, abundant in the wet ground at the margin of the small lake and forming a continuous ring outside the belt of *Polygonum* growing at the water's edge.

India ; Andamans, Burma, Malaya.

181. *Strobilanthus phyllostachyus* Kurz.

Great and Little Coco, a gregarious species common on most of the rocky promontories on the east coast of both islands.

Pegu, Tenasserim.

182. *Eranthemum album* Nees.

Great Coco ; common in the beach-forests.

Chittagong, Burma ; Malaya ; Andamans, Nicobars.

183. *Eranthemum cinnabarinum* Wall., var. *succisifolia* Clarke (*E. succisifolium* Kurz.).

Great and Little Coco ; common in the beach-forest.

Nicobars.

These two species are recorded because in the large suite of specimens collected, some examples agree exactly with Andamans specimens named *E. album* by Dr. T. Anderson, and others agree exactly with the original specimens of Mr. Kurz's *E. succisifolium*. But I do not think that there are really two species present. The plants are referred by Anderson to *E. album*, but are considered by Clarke a white-flowered fern of *E. cinnabarinum*, and are held by Kurz to be two distinct species. The original specimens of Kurz's *Eranthemum album*, T. And. ? (314 of Nicobars list) I cannot, however, distinguish from those of *E. succisifolium* (313 of that list).

184. *Rungia parviflora* Nees, var. *pectinata* Clarke.

Table Island ; in the light-house clearing.

India, Burma, Andamans ; a weed, introduced.

185. *PERISTROPHE ACUMINATA* Nees.  
Great Coco, very common on the east coast.  
Tenasserim, Malaya; Andamans.

#### VERBENACEÆ.

186. *LIPPIA NODIFLORA* Rich.  
Little Coco, in swampy ground at west side of island. plentiful.  
Cosmopolitan in the tropics.
187. *PREMNA INTEGRIFOLIA* Linn.  
In all the islands, very common on the coast.  
India, Ceylon; Burma, Malaya; Andamans, Nicobars; on sea coasts.
188. *PREMNA* sp.  
Great Coco; a climber common on the western sea-face, also obtained on Rutland Island.  
In fruit only; almost certainly *P. obtusifolia*.  
South Andaman, Malayan Archipelago, Australia.
189. *VITEX NEGUNDO* Linn.  
Great Coco; east coast, very rare; Little Coco; in salt marshes, extremely common.  
Afghanistan, Tropical Asia, Philippines.
190. *VITEX PUBESCENS* Vahl.  
Table Island; common on north coast.  
India, Burma, Malaya.
191. *VITEX WIMBERLEYI* Kurz.  
Little Coco, not common.  
Andamans.
192. *CLERODENDRON INERME* Gaertn.  
In all the islands, extremely common on the coasts.  
India, Burma, Tenasserim, Andamans and Nicobars.
193. *AVICENNIA OFFICINALIS* Linn.  
Common in one mangrove swamp near south end of Great Coco; elsewhere rare.  
Indian, Malayan, and Polynesian sea-coasts.

#### LABIATÆ.

194. *ANISOMELES OVATA* R. Br.  
Great Coco; abundant in beach-forest at north end of island. This does not occur in the small clearing, but is very abundant in the jungle near it. It may have been introduced by man but is more probably indigenous; it occupies much the same situations and is even more plentiful in Diamond Island. Not previously reported from the Andamans.  
India, Burma, Malaya, China, Philippines.

## INCOMPLETE.

## NYCTAGINEÆ.

195. *BOERHAAVIA REPENS* Linn.

In all the islands, common on every rocky promontory and on all the isolated rocks on the reefs not covered by the tides.

Cosmopolitan in the tropics.

196. *PISONIA ACULEATA* Linn.

In all the islands, one of the commonest climbers in the beach-forests.

Cosmopolitan in the tropics.

197. *PISONIA EXCELSA* Blume.

In all the islands, common in the beach-forests.

Andamans, Malaya.

## AMARANTACEÆ.

198. *CELOSIA CRISTATA* Linn.

Table Island, an escape in the light-house clearing.

Cosmopolitan in the tropics.

199. *ACHYRANTHES ASPERA* Linn. *var. TYPICA.*

Table Island and Great Coco, common in the clearings, introduced.

Cosmopolitan in the tropics.

*var. PORPHYRISTACHYA* Hook. f.

Little Coco, very abundant in the beach-forests; stems 10–15 feet long, climbing over the sea-face jungle. A plant in habit remarkably unlike the preceding.

South-Eastern Asia.

200. *GOMPHRENA GLOBOSA*, Linn.

Table Island, an escape, but very plentiful and extending into the jungle.

Cosmopolitan in the tropics; probably originally American.

## POLYGONACEÆ.

201. *POLYGONUM BARBATUM* Linn.

Great Coco; this plant fringes the small lake at the north-east corner of the island, growing partly in and partly out of the water, just within it is a floating belt of *Panicum Myurus*, while outside is a ring of *Hygrophila quadrivalvis*. None occurs in the lake on Little Coco.

Africa; India, Ceylon; Burma, Malaya.

## ARISTOLOCHIACEÆ.

202. *BRAGANTIA TOMENTOSA* Blume.

Little Coco; abundant on the interior ridges.

Tenasserim, Andamans; Java.

203. *ARISTOLOCHIA TAGALA* Cham. & Schlecht.

Both islands, frequent.

India, Burma, Malaya; Nicobars.

PIPERACEÆ.

204. *PIPER CANINUM* Blume.

Great Coco.

Tenasserim, South Andaman, Malaya.

MYRISTICEÆ.

205. *MYRISTICA IRYA* Gaertn.

Great Coco; frequent in interior towards eastern side.

Ceylon, Andamans, Tenasserim, Malaya.

206. *MYRISTICA GLAUCA* Blume.

Great Coco.

Burma, Andamans, Malaya.

LAURINEÆ.

207. *DEHAASIA KURZII* King.

Little Coco.

Tenasserim, Andamans.

208. *HERNANDIA PELTATA* Meissn.

In all the islands, on the eastern coasts.

East Africa, Madagascar; Laccadives, Ceylon; Andamans, Nicobars; Mergui, Malaya, Archipelago; North Australia; Polynesia.

209. *CASSYTHA FILIFORMIS* Linn.

Great Coco, occasional; Little Coco, extremely plentiful on all the coasts.

Cosmopolitan in the tropics.

LORANTHACEÆ.

210. *LORANTHUS LONGIFLORUS* Desrouss.

Great and Little Coco.

India, Ceylon; Burma, Malaya; Andamans.

SANTALACEÆ.

211. *CHAMPEREIA GRIFFITHIANA* Planch.

Both islands; common on the coasts.

Tenasserim, Malaya; Andamans, Nicobars.



## EUPHORBIACEÆ.

212. *EUPHORBIA ATOTO* Forst.

In all the islands, very common on the sandy beaches.

India, Ceylon; Andamans, Nicobars; Malaya; Australia; China; Polynesia.

213. *EUPHORBIA PILULIFERA* Linn.

Table Island; in light-house clearing, still rare.

Cosmopolitan tropical and subtropical weed.

214. *BRIDELIA KURZII* Hook. f.

In all the islands, common on the western sea-face.

Nicobars.

215. *BRIDELIA TOMENTOSA* Blume.

Great Coco, common.

India; Burma; Andamans, Malaya; China; Philippines; North Australia.

216. *PHYLLANTHUS COLUMNARIS*, Muell.-Arg.

Table Island, common.

Pegu, Tenasserim.

217. *FLUEGGIA MICROCARPA* Blume.

Great Coco.

Africa; India, Ceylon; Assam, Burma, Malaya; Australia; China.

218. *CYCLOSTEMON ASSAMICUS* Hook. f.

In all the islands, a very common tree, gregarious where it occurs.

Sikkim, Assam.

219. *APOROSA VILLOSULA* Kurz.

Great Coco.

Pegu, Tenasserim, Andamans.

220. *CROTON SUBLYRATUS* Kurz.

In all the islands, common in the beach-forests.

Andamans and (perhaps) Tenasserim.

221. *BLACHIA ANDAMANICA* Hook. f.

Great Coco, coasts, very common; Little Coco, frequent in beach forests.

Andamans.

222. *CLAOXYLON LONGIFOLIUM* Muell.-Arg.

Great Coco.

Malaya.

223. *MALLOTUS ACUMINATUS* Muell.-Arg. (= *M. Helferianus* Kurz.).

Great Coco, common.

Tenasserim; Andamans; Malaya.

224. *MALLOTUS ANDAMANICUS* Hook. f.

Great and Little Coco; common, and, where it occurs, gregarious.

Andamans.

225. *MACARANGA TANARIUS* Muell.-Arg.

Great Coco and Little Coco; common in the beach-forests.

Arracan (Diamond Island); Andamans; Malaya.

226. *ONESMONE JAVANICA* Blume.

Great Coco; plentiful on rocky promontories at north end of island.

Bengal, Assam, Burma, Malaya.

## URTICACEÆ.

227. *PHYLOCHLAMYS SPINOSA* Bureau.

Little Coco, common.

India, Ceylon; Burma, Malaya; Andamans.

228. *PLECOSPERMUM ANDAMANICUM* King.

Little Coco.

Tenasserim, Andamans.

229. *FICUS BENJAMINA* Linn.

Great Coco; not in fruit, therefore the particular variety cannot be determined.

India, Assam, Burma, Andamans, Malaya.

230. *FICUS RUMPHII* Vahl.

Little Coco, on the east coast; this species is here very rare. In Diamond Island, Arracan, this is one of the commonest trees on the coast.

India, Burma, Malaya, Andamans.

231. *FICUS RETUSA* Linn. *var. NITIDA* Thunbg. (sp). *F. comosa* Curtis, Bot. Mag., t. 3305 [1834].

In all the islands, very common. The fruits of this species, as Mr. Kendall, I. M., pointed out to me, is one of the favourite foods of a large pigeon, *Carpophaga bicolor*, which visits the group in enormous numbers during the cold weather.

India; Burma; Andamans, Malaya; China; Australia; New Caledonia.

232. *FICUS BREVICUSPIS* Miq.

In all the islands, common. The fruits are borne both on young branches in leaf axils, and on old wood in bunches.

Andamans, Malaya.

233. *FICUS CALLOSA* Willd.

Great Coco.

India, Burma, Malaya.

234. *FICUS HISPIDA* Linn. f.

Great Coco, common.

India, Ceylon; Burma, Malaya.

*var. DEMONUM* Koenig (sp.).

Little Coco.

Distribution of type.

235. *FIGUS GRISEA* Wall. Cat. 4544.

Great Coco. Fruits of this a favourite food of the Green Parrots.  
Burma. (Salween valley).

236. *ANTIARIS TOXICARIA* Leschen.

Great Coco.

India, Ceylon; Burma, Tenasserim, Malaya.

237. *ARTOCARPUS GOMEZIANA* Wall.

Great Coco and Little Coco, very common.

Tenasserim, Malaya, Andamans.

#### GYMNOSPERMÆ.

#### CYCADACEÆ.

238. *CYCAS RUMPHII* Miq.

In all the islands, very common in beach-forests, sometimes attains a height of 50 feet, and a girth of over 5 feet.

Tenasserim, Andamans, Nicobars; Malaya; North Australia, New Guinea.

#### MONOCOTYLEDONES.

#### ORCHIDACEÆ.

239. *DENDROBIUM SECUNDUM* Wall.

In all the islands, common. The only *very* common orchid on forest trees; specimen brought and flowered at Calcutta.

Martaban, Tenasserim; Penang, Sumatra, Java, Cochin China.

240. *CALANTHE VERATRIFOLIA* R. Br.

Great Coco, not uncommon on the interior ridges. The same species was also found, a few days later, on Rutland Island at the opposite end of the Andaman group.

India, Andamans, Malaya.

241. *DORITE\$ WIGHTII* Benth. *var.* — ?

Great Coco, frequent on trees in the low, flat swampy land near the coast; specimens were brought and flowered at Calcutta. The foliage as well as the shape and markings of the flowers quite agree with those of the typical plant, but in the Coco Island specimens the flowers are distinctly larger and the ground colour is violet instead of yellow.

242. *AERIDES MULTIFLORUM* Roxb.

Great Coco, occasional near the sea.

India, Burma, Andamans, Malaya.

## 243. PHOLIDOTA IMBRICATA Lindl.

Great Coco, occasional.

India, Burma, Malaya.

## SCITAMINEÆ.

## 244. COSTUS SPECIOSUS Linn.

Great Coco, frequent.

India, Himalaya, Indo-China, China, Malaya.

## 245. ZINGIBER sp.

Great Coco, common. Near *Z. corollinum* Hance; probably a new species (*Baker in sched.*). In fruit only on the occasion of these visits; the rhizomes brought to Calcutta have not yet flowered.

## 246. MUSA SAPIENTUM Linn.

The *Plantain* is cultivated in the light-house garden; it has already disappeared, probably owing to the presence of cattle, from the site of the garden on Great Coco.

## . AMARYLLIDACEÆ.

## 247. CRINUM ASIATICUM Linn.

In all the islands, very common in the coast zone.

Andamans, Nicobars, Malaya.

## TACCACEÆ.

## 248. TACCA PINNATIFIDA Forst.

In all the islands, common in the coast zone. Some of these were huge specimens and the tubers brought to Calcutta produced leaves and flowers in no way inferior to those in their native habitat. The following measurements are from an average specimen—the tallest grown had a peduncle 116 inches high.

Leaf, stalk 40 inches, lamina 3-fid, each lobe 36 in. long, the lateral lobes 2-fid from the 8th inch; the central lobe and each segment of the lateral lobes 36 in. across; peduncle 80 inches; leafy bracts 3 in. long, 2 in. across; filiform bracts 16 in. long, their basal sixth green, the remainder pale purple; perianth segments  $\frac{2}{3}$  in. long,  $\frac{1}{3}$  in. across, pale green with purplish edges.

India, Burma, Malaya, Andamans,

## DIOSCOREACEÆ.

## 249. DIOSCOREA GLABRA Roxb.

In all the islands, common.

India, Burma, Malaya, Andamans.

250. *Dioscorea pentaphylla* Linn.

In all the islands, common.

India, Ceylon, Burma.

LILIACEÆ.

251. *Smilax macrophylla* Roxb.

In all the islands, common.

Eastern Himalaya, Assam, Arracan, Pegu.

252. *Asparagus racemosus* Roxb.

Great Coco; in low-lying lands behind the mangrove-swamps at north end of island.

India, Burma, Andamans, Java.

253. *Dracena angustifolia* Roxb.

Both islands; small tree in coast zone.

India, Burma, Andamans, Malaya; N. Australia.

254. *Dracena spicata* Roxb.

In all the islands, frequent on interior ridges.

India, Burma, Malaya, Andamans, Nicobars.

255. *Gloriosa superba* Linn.

Great Coco; east coast, frequent.

Tropical Asia and Africa.

COMMELYNEÆ.

256. *Pollia zorzogonensis* Endl.

Great Coco, rather common.

India, Burma, Andamans, Narcondam, Malaya.

257. *Commelina obliqua* Hassk.

Great Coco. Seeds smooth, but only two in number in both specimens collected.

India, Burma, Malaya; not before reported from the Andamans.

258. *Aneilema ovatum* Wall.

Great Coco, Little Coco; common.

Pegu, Tenasserim, Andamans.

FLAGELLARIÆ.

259. *Flagellaria indica* Linn.

In all the islands, very common in beach-forests.

India, Indo-China, Andamans, Nicobars, Malaya; Australia; Mauritius.

## PALMÆ.

260. *CARYOTA SOBOLIFERA* Wall.

In all the islands, very common in beach-forests.

Indo-China, Andamans, Malaya.

261. *CORYPHA ELATA* Roxb., Flor. Ind. 2, 176; Griff., Ind. Palm. 112, t. 220 D.—*C. Gebanga* Kurz, Jour. As. Soc. Beng. 43, pt. 2, 206, nec Blume.—*C. macropoda* Kurz, l. c. 205, t. 15.

Great Coco, rare; Little Coco, very common.

This palm, which is very common in Little Coco and particularly so near the lake at the south-west corner of the island has leaf stalks up to 25 feet long and leaves up to 20 feet across and is clearly identical with Kurz's *C. macropoda*. But Kurz's plant does not appear to be specifically distinct from *C. elata*. Kurz has himself in his subsequent writings noted that his first impression that this is a stemless palm was erroneous, admitting that it has a stem at least 8—12 feet high. Moreover in Little Coco at least one example had reached a height of 60 feet and was not yet in flower in 1890, while in 1889 and 1890 Dr. King and myself obtained both flowering and fruiting specimens of Kurz's Andamanese *Corypha* near Port Blair; these prove the species to be *Corypha elata*. Kurz is, I believe, in error in identifying Roxburgh's *C. elata* with Blume's *C. Gebanga*, the two trees—as grown in Hort. Calcutta—are very different in appearance; the leaves of *C. Gebanga* are much paler in colour and Blume's figure of the inflorescence of *C. Gebanga* (Rumphia 2, tt. 97, 98 and 105) shows an open panicle that will not at all suit *C. elata*, which has a very dense inflorescence like a gigantic head of parsley. In any case Roxburgh's name (1832) has four years' priority and Kurz's reduction is, therefore, on that ground alone, untenable. The writer is of opinion, and Dr. King agrees, that the examples of *C. elata* in Hort. Calcutta may have been originally introduced from the Andamans and that the species is only there indigenous. At all events it has not hitherto been found wild in any part of India or Burma.

262. *LIVISTONA* sp.

Great Coco; occasional on inland ridges. This palm, the 3 or 4 examples of which met with were stemless or had stems under two feet high, seems to be nearly related to *L. Jenkinsiana* Griff., Palm. Brit. Ind. 128, t. 226 A. B. and to *L. speciosa* Kurz, Jour. As. Soc. Beng., 43, 2, 204, t. 13, 14, the differences between which species Mr. Kurz himself admits are not great. The Coco species may not of course be a dwarf one, but if it is not it seems remarkable that no tall examples were met with. The leaves are remarkably like those of *L. speciosa* and Mr.

Kurz's description would suit them very well except that the transverse veins are, in the Great Coco plant, even more prominent than in *L. speciosa*; the *ligula* however is very different.

Mr. Kurz does not describe the *ligula* in *L. speciosa*; it is, however, shewn (perfectly accurately) in t. 13, f. 5. as cordate and entire—just as it is in *L. Jenkinsiana*. In the species under review the *ligula* is larger, ovate orbicular, and armed at the margin with small but hard, flat black blunt spines, a character exhibited by no flabellate-leaved palm of which specimens are preserved in Calcutta Herbarium.

263. *CALAMUS ANDAMANICUS* Kurz.

In all the islands, common.

Andamans.

264. *CALAMUS TIGRINUS* Kurz.

In all the islands, common.

Andamans, Tenasserim.

265. *COCOS NUCIFERA* Linn.

In all the islands, extremely abundant. Probably not truly indigenous, though perhaps not intentionally introduced. It has long been known that this palm occurred on these islands; the name "Cocos Islands," applied to the group, is of older date than 1652, and it has often been the subject of remark that while this is so and while every island in the Nicobars, even uninhabited ones like Batti Malv, has Coco-nut trees, the species is altogether absent from the intervening Andaman islands. Kurz, in *Forest Flora Brit. Burma*, says the Coco-nut occurs on north-east Andaman also, but the writer is unable to ascertain on what authority, and the statement is contradicted by the officers of the settlement at Port Blair who alone know the coasts of the group intimately. There are here and there individual trees on the Andaman coasts now; Dr. Alcock tells me there is one on South Sentinel; the writer saw one on Rutland Island; Captain Simpson, Assistant Port Officer, Madras, tells me he recollects being in a small bay in one of the islands of the Eastern Andaman Archipelago where there are some trees. But all these are quite recent introductions and are mainly due to the humanitarian efforts of the officers of the Andamans who plant them when they visit various places along the coasts; the instance quoted by Captain Simpson is, however, attributed to a wreck. No explanation based on the set of currents in these seas is sufficient to explain the peculiar distribution of the Palm, and the writer is inclined to believe that the presence of the species in the Coco Islands is due to the wreck of some Coco-laden craft on their coasts.

Once established the species spreads with great rapidity. On Barren Island one tree was known in 1881; in 1891 thirteen were counted, of

which seven were bearing. In Narcondam there were in 1891 Coco-nut trees, many of them bearing, in 3 separate bays on the N. W., N., and N. E. aspects of the island respectively. These *may* have been brought from the Coco group by a strong North-East to South-West current that sets down on this island from the neighbourhood of that group, but I am inclined to think they owe their presence to an act of unrecorded piety on the part of some humane individual who has visited the island, for in the North Bay where the trees are most numerous there is, just behind the coco-nut zone, a large patch of Plantains which clearly must have been introduced intentionally.

It should not be forgotten that at some remote period a colony may have been started in the Coco group and then abandoned. It is known that in recent times two such attempts have been made and that both have failed owing to the unhealthiness of the place. It may be that the Coco-nut was intentionally introduced on some similar occasion of which no record has been left. In any case, to speak of the coco-nut as "wild" here, as Mr. Kurz does (*Jour. As. Soc. Beng.*, xliii, Pt. 2, p. 200) is apt to convey the erroneous impression that the species is here truly indigenous.

The coco-nut cannot be said to be known in a truly wild state, though it occurs on many uninhabited islands, and its original home is by no means certain.

The quality of these coco-nuts is little inferior to that of those cultivated at Port Blair and though distinctly inferior to those cultivated in the Nicobars they are much the same as those on Butti Malv where there are no inhabitants.

America, Polynesia, Malaya, India.

#### PANDANEÆ.

##### 266. *PANDANUS ODORATISSIMUS* Linn. f.

In all the islands, common on the coasts.

India, Indo-China, Malaya, Andamans, Nicobars.

#### AROIDEÆ.

##### 267. *AMORPHOPHALLUS* sp. (aff. *A. bulbifer*).

Great Coco, common; Little Coco, occasional. Only leaves and very advanced fruit obtained; tubers brought to Calcutta have as yet only produced leaves, but these leaves are bulbiferous and indicate this as a species nearly related to, but apparently distinct from, both *A. bulbifer* and *A. tuberculiger*.

##### 268. *ALOCASIA FORNICATA* Schott. ••

Great Coco, common.

India, Indo-China, Malaya, Andamans.



269. *SCINDAPSUS OFFICINALIS* Schott.

In all the islands, common.

India, Indo-China, Malaya, Andamans.

270. *POTHOS SCANDENS* Linn.

In all the Islands, common.

India, Indo-China, Malaya, Andamans.

## NAIADACEÆ.

271. *CYMODOCEA CILIATA* Ehrh. ?

On the reefs of all the islands ; extremely common and forming vast submarine meadows. This species is exceedingly common in the Andamans and has been met with in equal abundance at Rungachang near Port Blair (there associated with another species of apparently the same genus), at Rutland Island, at Little Andaman (there in company with *Halophila ovalis*), and at Car Nicobar. No flowering or fruiting specimens have yet been reported at Calcutta. This is the plant supposed by Kurz (*Jour. As. Soc. Beng.*, xlv, Pt. 2, p. 154) to be a small form of *Enhalus aceroides*.

272. *ZANICHELLIA PALUSTRIS* Linn.

Little Coco, in the small lake along with *Chara fetida*.

Cosmopolitan in salt-marshes.

## CYPERACEÆ.

273. *CYPERUS POLYSTACHYUS* Rottb.

Great Coco ; west coast, rather common on the bare grassy slopes.  
Cosmopolitan.

274. *CYPERUS ELEGANS* Linn.

Great Coco ; frequent in wet patches in the dense interior jungle.  
India, Indo-China, Malaya, Andamans ; America.

275. *CYPERUS DILETUS* Vahl.

Great Coco ; occasional.

India, Indo-China, Malaya, Andamans.

276. *CYPERUS PENNATUS* Lamk.

In all the islands, very common on the coast in rocky places.

Sea-shores of the Indian Ocean.

277. *KYLLINGA BREVIIFOLIA* Roxb.

Great Coco, clearing at north-east corner ; Table Island, clearing near light-house ; common.

India, Indo-China, Malaya, Andamans.

278. *FIMBRISTYLIS DIPHYLLA* Vahl.

Table Island and Great Coco, in the clearings ; also on the rocky coasts.

India, Burma, Malaya, Andamans ; Australia, Africa, America.

279. *FIMBRISTYLIS FERRUGINEA* Vahl.  
Great Coco and Little Coco, on coral-shingle.  
India, Burma, Malaya.
280. *FIMBRISTYLIS QUINQUEANGULARIS* Kunth.  
Great Coco and Table Island, in marshy ground.  
India, Indo-China, Malaya.
281. *FIMBRISTYLIS MILIACEA* Vahl.  
Great Coco, flat marshy ground near the small lake.  
India, Indo-China, Malaya.
282. *SCIRPUS SUBULATUS* Vahl.  
Little Coco, in the lake at the south-west corner of the island, abundant.  
Bengal (Salt lakes); Beluchistan, Panjab; Africa, (Egypt).

## GRAMINEÆ.

283. *PASPALUM SCROBICULATUM* Retz.  
Little Coco, abundant in the lake.  
India, Indo-China, Malaya.
284. *PANICUM CILIARE* Retz.  
Great Coco, near south end of island.  
India, Indo-China.
285. *PANICUM COLONUM* Linn.  
Table Island, light-house clearing; Great Coco in the clearing, also at south end of island in Coco-nut zone.  
Cosmopolitan in the tropics.
286. *PANICUM HELOPUS* Trin.  
Table Island, in the clearing.  
India, Indo-China.
287. *PANICUM JAVANICUM* Poir.  
Great Coco, common.  
India, Indo-China, Malaya.
288. *PANICUM MYRUS* Lamk.  
Great Coco; in matted masses floating in the small lake at north-east corner of island.  
India, Indo-China, Malaya.
289. *PANICUM MONTANUM* Roxb.  
Great Coco, with the next species, in deep jungle.  
India, Indo-China, Malaya, Andamans.
290. *OPLISMENUS COMPOSITUS* Roem. & Schult.  
Great Coco, in dense jungle, occasional.  
Cosmopolitan or nearly so.

291. *THUAREA SARMENTOSA* Pers.

Great Coco, common as a turf under Coco-nut trees.

Shores of Indian Ocean.

292. *ISCHÆMUM CILIARE* RETZ.

Great Coco, common on grassy slopes and under Coco-nut trees.

India, Indo-China, Malaya.

293. *ISCHÆMUM MUTICUM* Linn.

Great Coco, occasional only; Little Coco, extremely abundant.

India, Indo-China, Malaya.

294. *ANDROPOGON CONTORTUS* Linn.

Table Island and Great Coco; the common grass both in the clearings and on the naturally bare headlands of the western coast.

Cosmopolitan in the tropics.

295. *ELEUSINE INDICA* Gaertn.

Table Island, frequent; Great Coco, rare.

Cosmopolitan in the tropics.

296. *ELEUSINE ÆGYPTIACA* Roxb.

Table Island; in the light-house clearing, scarce.

Cosmopolitan, or nearly so, in the tropics.

297. *DENDROCALAMUS STRICTUS* Nees, *var.*—?

Great Coco, on one hill, abundant; Table Island, plentiful. Flowering examples were obtained on Table Island which have been kindly examined by Mr. J. S. Gamble. There seems no doubt as to the species, the specimens do not however quite agree with typical examples. There is little doubt that this Bamboo is here indigenous and, from an account received from Mr. Godwin-Austen (formerly of Port Blair), appears to occur on Saddle Peak in North Andaman also. It does not occur in South Andaman.

India, Burmah.

## CRYPTOGAMÆ.

## VASCULARES.

## FILICES.

298. *DAVALLIA SOLIDA* Sw.

Great Coco, east coast, very common on *Mimysops littoralis* and other tall trees.

Andamans, Malaya, Polynesia, Australia.

299. *ADIANTUM LUNULATUM* Burm.

Great Coco, on interior ridges frequent; Table Island, common.

Cosmopolitan in the tropics.

300. *CERATOPTERIS THALICTROIDES* Brogn.

Great Coco, in wet places in the interior with *Cyperus elegans*.

Cosmopolitan in the tropics.

When discussing the weeds of the Andaman Flora (*Jour. As. Soc. Beng.*) the writer imagined this fern to have been introduced into these islands by human agency, at least indirectly. But the Coco locality proves sufficiently to his mind that its presence is altogether independent of man's presence, and he has since then collected it in similar situations in South Andaman. It is probably not at all common however, and hence it had escaped the notice of Mr. Kurz when he collected in the Andamans.

301. *POLYPODIUM IRIOIDES* Lamk.

In all the islands, frequent.

India, Indo-China, Andamans, Malaya; Australia, Polynesia; Africa

302. *POLYPODIUM ADNASCENS* Sw.

Great Coco, on trees in mangrove swamps; Little Coco, on trees in lagoon at south-west end of island.

India, Indo-China; Andamans, Nicobars; Malaya; Polynesia; Africa.

303. *POLYPODIUM QUERCIFOLIUM* Linn.

In all the islands, very plentiful in the same situations as *Davallia solida*.

India, Indo-China; Andamans, Nicobars; Malaya; North Australia.

304. *VITTARIA ELONGATA* Sw.

Great Coco, not very common.

India, Indo-China; Andamans, Malaya; Australia, Polynesia; Africa.

305. *ACROSTICHUM SCANDENS* J. Sm.

Great Coco, very common in the low-lying lands behind the coast zone.

India, Indo-China; Andamans, Malaya; Australia, Polynesia.

306. *ACROSTICHUM APPENDICULATUM* Willd., *var. SETOSA*.

Great Coco, the only common ground fern on the interior ridges.

India, Indo-China; Andamans, Malaya.

307. *LYGODIUM FLEXUOSUM* Sw. & Bedd.

In all the islands, common in the dense dwarfed jungle on the ridges.

India, Burma; Andamans, Malaya; Australia; Africa.

## CHARACEÆ.

308. *CHARA FETIDA* A. Braun.

Little Coco; abundant in the lagoon.

India, Indo-China.

## MUSCI.

309. *CALYMPERES DOZYANUM* Mitt.

Great Coco, on damp rocks in a sheltered bay on west coast, also on *Mimusops* trunks in coast zone; 'Little Coco, on trunks of *Mimusops littoralis*.

Samoa; Java, Philippines; Ceylon; Admiralty Islands.

310. *BRYUM CORONATUM* Schwaegr.

Great Coco, on charred stumps of *Mimusops littoralis* at south end of island.

Tropics of both hemispheres.

## HEPATICÆ.

311. *LEJEUNIA* sp.

In all the islands, on trees, common.

312. *HEPATICA* sp. (genus indeterminable).

Great Coco, on trees in mangrove swamps.

## CELLULARES.

## LICHENES.

313. *COLLEMA NIGRESCENS* Achar.

Little Coco, soft pulpy masses on stems of *Cycas Rumphii*  
Cosmopolitan.

314. *PHYSCIA* sp. (near *Ph. obscura* Fr.)

Little Coco, on stems of *Cycas Rumphii*.

315. *PHYSCIA* sp.

Great Coco, on rocks, west coast.

316. *LEPRARIA* sp. (specimens imperfect).

Great Coco.

## FUNGI.

317. *LENTINUS LEUCOCHROUS* Fries.

Great Coco, on dead wood, common

\* Asia.

318. *LENZITES DEPLANATA* Fries.

Great Coco, on dead wood, common.

\* Asia.

319. *LENZITES SUBFERRUGINEA* Berk.

Great Coco

\* Asia.

320. *POLYPORUS FULVUS* Fries.  
Great Coco.  
\* Asia.
321. *POLYPORUS XANTHOPUS* Fries.  
Great Coco, on dead stems.  
Cosmopolitan in the tropics.
322. *POLYPORUS SANGUINEUS* Fries.  
Great Coco; on dead stems of *Cocos nucifera*.  
Cosmopolitan in the tropics.
323. *POLYPORUS GRAMMATOCEPHALUS* Berk.  
Great Coco, on dead wood.  
India, Indo-China, Malaya, Australia, America.
324. *POLYPORUS AUSTRALIS* Fries.  
Great Coco.  
Cosmopolitan in the tropics.
325. *HEXAGONA PERGAMENEA* Berk. & Broome.  
Great Coco,  
Ceylon (*Berkeley and Broome, Jour. Linn. Soc.* xiv, 57).
326. *HEXAGONA SRRICEO-HIRSUTUS* Kl.  
Great Coco; on dead wood.  
North America (*Klotzsch, Linnæa* viii, 483).
327. *HEXAGONA TENUIS* Hook.  
Great Coco, on dead wood.  
Nicobars (*Fenzl, Novara Bot.* ii, 138); Mauritius (*Klotzsch, Linnæa* viii, 482).
328. *DEDELEA FLABELLUM* Berk.  
Great Coco, on dead wood.  
\* Asia.
329. *DEDELEA SANGUINEA* Kl.  
Great Coco, on dead wood.  
India (*Klotsch, Linnæa* viii, 481).
330. *DEDELEA QUERCINA* Fries.  
Great Coco, on dead wood.  
Cosmopolitan.
331. *DEDELEA CONCENTRICA* Fries.  
Great Coco, on dead wood.  
Cosmopolitan in the tropics.
332. *THELEPHORA INCRUSTANS* Pers.  
Great Coco, on *Pongamia glabra*; Little Coco, on *Oycas Rumphii*.  
Cosmopolitan.
333. *BOVISTA LILACINA* Berk.  
Great Coco, on grassy slopes.  
Cosmopolitan in the tropics.

334. *HIRNEOLA POLYTRICHA* Mont.

Great Coco, on dead wood.

Tropics of both hemispheres and Polynesia.

335. *XYLARIA CLAVARIOIDES* G. Massée, sp. nov.

*Xylaria* (*Xylocoryne*) stromatibus sæpius solitariis rarius in cæspitibus 2—5 connatis cylindraceis, 2—4 cm. altis,  $\frac{1}{2}$ — $\frac{1}{2}$  diam.; extus atris papilloso-scabris, intus candidis stipite elongato, coriaceo-suberoso nigro-velutino demum nudo; peritheciis clavulæ omnino immersis; ascis cylindricis, pedicellatis, octosporis; sporidiis oblique monostichis, ellipticis, nigricantibus 10—11  $\times$   $\mu$ . (Prain n. 45). In lignis putridis.

Great Coco, common on dead stems of *Minusops littoralis*.336. *DALDINIA VERNICOSA* Cos. & de Not.

Great Coco, on dead wood.

India, America.

337. *RHYTISMA* sp.In all the islands, on leaves of *Ficus brevicuspis*.

Andamans, (the same species apparently is equally common at Port Blair).

## 338. ———.

Besides the above there occurs on both islands a *Fungus* which appears to be very widely dispersed throughout the Andamans and Nicobars, but has so far been only found as a white mycelium that appears as a narrow band on the bark of slender branches, runs upwards along these and divides into still narrower bands on the branchlets; these branch and anastomose and send still narrower bands (threads) upwards along the petioles of the leaves and finally spread as a thin network on the under surface of the lamina. The writer has found the same blight (known to the officers at Port Blair as "thread-blight") on the following species: *Alsodeia bengalensis*, *Ochna squarrosa*, *Bombax inigne*, *Camellia theifera*, *Hibiscus rosa-sinensis*, *Gardenia* sp., *Pongamia glabra*, *Diplospora singularis*, *Blachia andamanica*, *Ficus nitida*; it is also reported to occur on a species of *Phalenopsis*. Its effect is in every case the same, the leaves affected become yellow and sickly, and as regards *Ochna* among indigenous species and the Tea-plant among cultivated species, when affected they become brown and die. The blight spreads with great rapidity and for a time threatened the existence of the Tea-industry at Port Blair. Drs. Cunningham and Barclay have both examined specimens but as there is no sign of any advance beyond the mycelial stage the position of the *Fungus* is at present indeterminable.

339. ———.

A second fungus of some interest is an *Uredine* that was found in considerable quantity on *Clerodendron inerme*. This the writer has met with, always producing the same characteristic effects on this *Clerodendron*, in South Andaman, Little Andaman, and Car Nicobar, as well as on Great Coco. The specimens were examined by the late Dr. Barclay, but were found insufficient for determination.

340. ———.

A third fungus of note causes a "dry-rot" in the fallen trunks of *Mimusops littoralis* on the beach. The effect produced simulates in a wonderful manner charring by fire; it appears to be confined, so far as the drift timber and wreckage on these islands is concerned, to *Mimusops* and *Quercus*—the planks of a wooden vessel, apparently of oak, that had been wrecked on Little Coco, being attacked like the Bullock-wood trees; Teak, Sundri and other logs were not affected.

## ALGÆ.

341. *SARGASSUM ILICIFOLIUM* J. Agardh.

In all the islands; in great beds at the outer margins of the fringing reefs and in the deeper water beyond; the only really common sea-wood.

Almost Cosmopolitan in the tropics; not from Australia (*Hemsl., Report on Bot. of Admiralty Islands*, p. 271).

342. *TURBINARIA ORNATA* J. Agardh.

In all the islands; rather common both on coral and on sandstone reefs.

\* Indian Ocean.

343. *PADINA PAVONIA* Gaill.

In all the islands; on both coral and sandstone.

Cosmopolitan in tropical seas.

344. *DICTYOTA DICHOTOMA* Lamour.

Great Coco; on coral reefs.

Common in both north and south temperate seas, rarer in the tropics.

345. *LITHOTHAMNION POLYMORPHUM* Aresch.

Great Coco; on coral reefs.

Atlantic, Mediterranean, South Africa; Chonos Archipelago.

346. *ACANTHOPHORA THIERII* Lamour.

Little Coco; pools on coral reefs.

Cosmopolitan in tropical seas.

347. *JANIA TENELLA* Kuetz.

Great Coco; on reefs, on *Lithothamnion polymorphum*.

\* Indian Ocean.



348. *GRACILARIA CRASSA* Harv.

In both islands ; in pools on coral sand.

\* Indian Ocean.

349. *GELIDIUM CORNEUM* J. Agardh.

Great Coco ; on coral reefs ; also growing on *Halimeda Opuntia*.

Almost Cosmopolitan.

[A specimen of a *Gelidium* washed up by the tide on Little Coco, was too much withered and bleached to be identified ; another was collected there on the reefs, but in too early a stage of development to be named.]

350. *CAULERPA CLAVIFERA* J. Agardh.

Both islands ; on reefs.

Cosmopolitan in tropical seas.

351. *CAULERPA PLUMARIS* J. Agardh.

Little Coco ; in pools on coral reefs.

\* Indian Ocean.

352. *VALONIA FASTIGIATA* Harv.

Great Coco ; on coral reefs.

Indian Ocean and Pacific.

353. *VALONIA CONFEROIDES* Harv.

Great Coco ; in pools on coral sand.

\* Indian Ocean.

[A species of *Valonia* was collected on Little Coco also, but in too early a stage of development to be named].

354. *HALIMEDA OPUNTIA* Lamour.

In both islands ; both on sandstone and on coral reefs, rather common.

Cosmopolitan in tropical seas.

355. *SIPHONOCLOUDUS ? FILIFORMIS* De Toni.

Washed ashore on the coast of Little Coco after stormy weather that prevailed for three days during our visit.

356. *VAUCHERIA* sp.

Little Coco ; on sandstone reefs. None of the specimens obtained were in fruit.

Andamans and Nicobars, the same species apparently was found by the writer to be plentiful in South Andaman and in Car Nicobar.

357. *CALOTHRIX PULVINATA* J. Agardh.

Little Coco ; in pools above high water mark.

Cosmopolitan.

## 358. ———.

A *Nostocaceous Alga* in habit, very like the preceding, was obtained

in the shallower *tidal* pools on Great Coco, but the specimens were too much withered to be determinable.

[Where an asterisk precedes the distribution of any *Fungus* or *Alga* it has been impossible to ascertain whether the species in question extends beyond the area indicated].

### § § § NATURE, DISTRIBUTION, AND PROBABLE ORIGIN OF THE FLORA.

In this list 358 distinct species are recorded, distributed among 268 genera and 95 natural orders; 297 species are *Phanerogams* and 61 are *Cryptogams*, giving a proportion of nearly five flowering plants to one flowerless species, the exact proportions and percentages being:—

Phanerogams : Cryptogams :: 4·85 : 1.

Phanerogams = 83 %; Cryptogams = 17 %.

In the two groups *Filices* and *Alge* the list represents the *Cryptogamic* flora with probably the same degree of adequacy that it does the *Phanerogamic*. In the other *Cryptogamic* groups it is to be feared the representation is not so complete. Still the scarcity of *Mosses* and *Lichens* is a very striking feature of the flora, so is the paucity of *Ferns*; with all three groups it is not merely a case of few species being present, there are, except perhaps in the case of *Acrostichum scandens*, which is common, remarkably few individuals of these species.

Among the 297 *Phanerogams*, 238 are *Dicots*; only one of these (*Cycas Rumphii*) is a *Gymnosperm*, the other 59 being *Monocots*. The *Dicots* are distributed amongst 59 natural orders and 178 genera, the *Monocots* amongst 14 natural orders and 45 genera. The proportions and percentages here are:—

Dicots : Monocots :: 4 : 1.

Dicotyledons = 80 %; Monocotyledons = 20 %.

Altogether 66 per cent. of the flora consists of *Dicotyledons*, whilst among these the *Polypetalæ* exceed in number the rest of the groups combined, a somewhat unusual circumstance, since, as regards species at least, the Indian *Gamopetalæ* usually exceed the *Polypetalæ*; *Polypetalæ* here constitute, as it happens, one-third, or 33 % of the whole flora.

There are only 15 *Vascular Cryptogams* in the list as against 46 *Cellular Cryptogams*; these are together distributed amongst 45 genera and 22 natural orders; The proportions and percentages are:—

Vascular : Cellular :: 1 : 3.

Vascular Cryptogams = 25 %; Cellular Cryptogams = 75 %.

The subjoined table gives a synoptic view of the systematic disposition of the Coco Island Flora.

TABLE I. *Systematic synopsis of Coco Island orders, genera and species.*

|                       |                |                 |                  |
|-----------------------|----------------|-----------------|------------------|
| PHANEROGAMÆ .....     | 73             | 223             | 297              |
| Dicotyledones .....   | 59             | 178             | 238              |
| Angiospermæ .....     | 58             | 177             | 237              |
| Polypetalæ .....      | 30             | 86              | 119              |
| Thalamifloræ .....    | 10             | 19              | 81               |
| Discifloræ .....      | 10             | 29              | 33               |
| Calycifloræ .....     | 10             | 38              | 55               |
| Gamopetalæ .....      | 17             | 59              | 75               |
| Incomplete .....      | 11             | 32              | 43               |
| Gymnospermæ .....     | 1              | 1               | 1                |
| Monocotyledones ..... | 14             | 45              | 59               |
| CRYPTOGAMÆ .....      | 22             | 45              | 61               |
| Vasculares .....      | 8              | 12              | 15               |
| Filices .....         | 4              | 7               | 10               |
| Characeæ .....        | 1              | 1               | 1                |
| Musci .....           | 1              | 2               | 2                |
| Hepatium .....        | 2              | 2               | 2                |
| Cellulares .....      | 14             | 33              | 46               |
| Lichenes .....        | 2              | 3               | 4                |
| Fungi .....           | 7              | 14              | 24               |
| Algæ .....            | 5              | 16              | 18               |
| TOTAL .....           | NAT. ORDERS 95 | Genera..... 268 | Species..... 358 |

Of the 73 natural orders of *Phanerogams* 24 are represented by single species and 14 more by two species each. The most extensively represented natural order is *Leguminosæ*, with 34 species; followed after a long interval by *Euphorbiaceæ* and *Gramineæ*, each 15 sp.; *Convolvulaceæ*, 14 sp.; *Rubiaceæ*, 13 sp.; *Urticaceæ*, 11 sp.; *Cyperaceæ*, 10 sp. *Filices*, amongst *Cryptogams*, are also represented by 10 species. None of the other orders have more than 8 species.

As to genera: 29 of these natural orders of *Phanerogams* are represented by one genus; 13 by 2 genera; 11 by 3 genera; 6 by 4 genera; 5 by 5 genera; 4 by 6 genera; one natural order each where there are 7 genera (*Apocynæ*); 8 genera (*Gramineæ*); 11 genera (*Rubiaceæ*); 12 genera (*Euphorbiaceæ*); and 22 genera (*Leguminosæ*): *Leguminosæ* thus leads both as regards genera and species. The Subjoined table exhibits the relationship of the orders, according to the wealth of their representation.

TABLE II. *Natural orders of Coco Island Phanerogams arranged according to their richness in species.*

| Number of species. | Number of orders. | .. NAMES OF ORDERS.            |
|--------------------|-------------------|--------------------------------|
| 34                 | 1                 | <i>Leguminosæ.</i>             |
| 15                 | 2                 | <i>Euphorbiaceæ, Gramineæ.</i> |

| Number<br>of<br>species. | Number<br>of<br>orders. | NAMES OF ORDERS.   |
|--------------------------|-------------------------|--|
| 14                       | 1                       | <i>Convolvulaceæ.</i>  |
| 13                       | 1                       | <i>Rubiaceæ.</i>   |
| 11                       | 1                       | <i>Urticaceæ.</i>  |
| 10                       | 1                       | <i>Cyperaceæ.</i> [ <i>Filices</i> are also represented by 10 species.]  |
| 8                        | 3                       | <i>Malvaceæ, Sterculiaceæ, Verbenaceæ.</i>   |
| 7                        | 3                       | <i>Compositæ, Apocynæ, Acanthaceæ.</i>   |
| 6                        | 2                       | <i>Anacardiaceæ, Palmæ.</i>  |
| 5                        | 6                       | <i>Ampelidæ, Sapindaceæ, Rhizophoræ, Combretaceæ, Orchidaceæ, Liliaceæ.</i>  |
| 4                        | 4                       | <i>Tiliaceæ, Meliaceæ, Asclepiadaceæ, Aroidæ.</i>  |
| 3                        | 10                      | <i>Olacinæ, Celastrinæ, Rhamnæ, Lythraceæ, Solanaceæ, Nyctagineæ, Amarantaceæ, Laurinæ, Scitamineæ, Commelynaceæ.</i>  |
| 2                        | 14                      | <i>Menispermaceæ, Capparidæ, Guttiferæ, Dipterocarpaceæ, Burseraceæ, Myrtaceæ, Passifloraceæ, Myrsinæ, Boraginæ, Bignoniaceæ, Aristolochiaceæ, Myristicæ, Dioscoreaceæ, Naiadæ.</i>  |
| 1                        | 24                      | <i>Anonacæ, Nymphæacæ, Violacæ, Rutacæ, Moringæ, Connaracæ, Melastomacæ, Cucurbitacæ, Ficoideæ, Goodenoviæ, Sapotaceæ, Ebenacæ, Gentianacæ, Scrophularinæ, Labiatæ, Polygonaceæ, Piperacæ, Loranthacæ, Santalacæ, Cycadaceæ, Amaryllidaceæ, Taccaceæ, Flagellariæ, Pandanaceæ.</i> |

If the species are classified according to their habit we find that 78 are climbers, 74 are trees that may exceed 30 feet in height, 20 are small trees that do not exceed 30 feet, 48 are shrubs and 138 are herbaceous, (treating as herbaceous species like *Carica*, *Scevola*, *Musa*, *Crinum*, etc., and all *Cryptogams* except the two climbing ferns, *Lygodium* and *Acrostichum scandens*, which are here included among the other climbers). But though as regards number of species herbaceous forms are so largely represented they are as a matter of fact extremely inconspicuous, two-fifths of them being cryptogams and one-third of these being marine. Nor, if we except the herbaceous climbers, which are here dealt with along with the woody ones, and the species that occur on the few bare grassy slopes, are herbaceous phanerogams more numerous than herbaceous cryptogams. The most numerous represented herbs are *Andropogon contortus*, *Desmodium polycarpon*, *Desmodium triquetum*, *Vernonia cinerea*, *Blumea virens*, the various species of *Fimbristylis*, *Cyperus pennatus* and *polystachyus*, *Boerhaavia repens*, *Ischæmum muticum*, *Thuarea sarmentosa*. Herbaceous species that frequent deep

jungle only, such as *Desmodium laxiflorum*, *Urena lobata*, *Cyperus elegans*, *Oplismenus compositus*, *Panicum montanum*, *Alocasia fornicata*, *Costus speciosus*, *Zingiber* sp., *Amorphophallus* sp., *Acrostichum appendiculatum*, *Ceratopteris thalictroides*, etc., are not only very rarely met with, but are represented by extremely few individuals where they do occur.

Woody shrubs and small trees taken together do not, as regards species, quite equal in number the large trees. In point of number of individuals, however, this is not the case, for it is not unusual to find these, woody shrubs and the smaller trees truly gregarious, particularly on the ridges; the chief examples are *Glycosmis pentaphylla*, *Alsodeia bengalensis*, *Glyptopetalum calocarpum*, *Cyclostemon assamicus*, *Macaranga Tanarius*, *Milium* sp., *Cynometra ramiflora*, *Leea sambucina*, *Dendrocalamus strictus*; a far larger area is covered by small trees and woody undershrubs heavily loaded with creepers than is covered by tall forest. In the mangrove-swamps most species may be spoken of as gregarious, but even here there is no great number of trees over 40 feet high; and the only gregarious tall trees are *Mimusops littoralis* and *Gyrocarpus Jacquinii*, both denizens of the beach-forest behind the Coco-nut zone, and *Cocos nucifera* itself. Among the arboreal species in these islands have to be included *Ocycas Rumphii*, which is very commonly 30—35 feet high and of which one specimen measured in Great Coco had a clear stem from ground to crown of 42 feet; also *Tournefortia argentea* which in Little Coco (and elsewhere in the Andaman group) is a tree 25—40 feet high with very black bark and a trunk often 3—3½ feet in girth; *Pongamia glabra* too, recorded by Mr. Baker in the *F. B. I.* as sometimes a climber, is here, as it also is in Bengal, always a tree from 20—60 feet in height. *Salacia prinoidea* on the other hand is here always a heavy extensive climber.

Erect woody species therefore, including both trees and shrubs in this category, form almost exactly two-sevenths of the flora as regards number of species. As regards individuals, however, it will be no over-estimation to say that these constitute six-sevenths of the vegetation, not merely in bulk, but in actual number of individuals.

Climbing species, as compared with those having an erect or prostrate habit, show a much higher proportion of woody to herbaceous species. This is owing to the fact that of the 72 climbers only two are cryptogams, while in the other group 59 cryptogams are included. To give therefore an accurate conception of the conditions that prevail, the Cellular cryptogams ought to be excluded. Of the 312 Phanerogams and Vascular cryptogams 234 are of erect habit and 78 are climbing, giving a proportion of:—

Erect sp. : climbing sp. : 4 : 1.

Among these erect vascular plants the proportion of woody to herbaceous is therefore :—

Woody sp. : Herbaceous sp. : : 3 : 2.

Of the climbers 35 are woody and 43 are herbaceous so that here the proportion is :—

Woody sp. : Herbaceous sp. : : 2 :  $2\frac{1}{2}$ .

Instead therefore of being lower amongst climbers than erect species, the proportion of herbaceous species to woody ones, when attention is confined to vascular plants only, is actually higher. And in number of individuals too there is a much more even balance among climbing species, since herbaceous climbing species, as well as woody ones, can easily raise themselves to the light and air for want of which no great quantity of herbaceous undergrowth can exist; indeed the herbaceous climbing species possess many advantages over their woody rivals, for they are not as a rule so heavy and as, moreover, they sometimes (e. g., *Modecca*, *Trichosanthes*, *Dioscorea*, *Gloriosa*) die down annually, they do not destroy the species on which they are supported so soon as do heavy perennial creepers like *Calamus*, *Thunbergia*, *Anodendron*, *Chonemorpha*, *Deris*, etc., which in a few seasons drag down the trees on which they climb.

Some of the woody climbers, such as *Anodendron* and *Thunbergia*, climb to great heights, and are not surpassed in this respect even by the *Modecca*. The majority of the woody climbers, however, like *Sarcostigma*, *Salacia*, *Pisonia aculeata*, *Plecosperrum*, the species of *Acacia* and of *Capparis*, are not to be found on tall trees at all, but load heavily the woody undergrowth of small trees and shrubs that forms the bulk of the forest. Nor is it unusual to find the forest, where composed of tall trees, exhibiting both classes of creepers; the characteristic lofty creepers on the tall trees overhead, the heavy woody creepers on the shrubby undergrowth below.

Of the climbing species 20, or 25%, are armed. As a rule the armed species may be said to belong to the class of undergrowth climbers; with the exception of the two species of *Calamus*, the lofty climbers are unarmed.

The habit of the Coco Island species is shewn in the subjoined table.

TABLE III. *Habit of Coco Island species.*

|  |     |
|--|-----|
| Vascular species (Phanerogams and Vascular Cryptogams).... | 358 |
| Species with erect habit .....                             | 234 |
| Woody species .....  | 142 |
| Trees .....  | 94  |
| Exceeding 30 feet .....                                    | 74  |
| Under 30 feet .....  | 20  |
| Shrubs .....   | 48  |
| Herbaceous species (Herbs and Herbaceous shrubs).....      | 92  |
| Climbing species .....                                     | 78  |
| Woody climbers .....                                       | 35  |
| Armed .....  | 13  |
| Unarmed.....   | 22  |
| Herbaceous climbers .....                                  | 43  |
| Armed .....  | 7   |
| Unarmed .....  | 36  |
| Non-vascular species (Lower Cryptogams) .....              | 46  |

Total Coco Island species ... 358

As regards habitat it will be gathered from what has been said above that a very large proportion of the flora is of arborescent forest-type. Next in point of numbers to the inland forest species, though only half as numerous, are the littoral species; following these at about an equal interval are parasitic or saprophytic species—a class here almost entirely composed of *Fungi*; after these in succession epiphytes; marine species, (mainly *Algae*); weeds of cultivation; cultivated species; marsh or water plants; and species of open grassy slopes.

The subjoined table gives the numbers of each class of species; the meadow species, here separated from the forest species, are, owing to the smallness of their numbers, in all subsequent tables included with the forest species.

TABLE IV. *Habitat of Coco Island species.*

|   |     |
|---|-----|
| Civilized species .....                       | 33  |
| Cultivated plants .....                       | 15  |
| Weeds of cultivation .....                    | 18  |
| Wild species.....                             | 325 |
| Parasites and Saprophytes (Phanerog. 1) ..... | 31  |
| Epiphytes.....                                | 19  |
| Marine plants (Phanerog. 1) .....             | 19  |
| Littoral species .....                        | 80  |
| Inland species .....                          | 176 |
| Forest species .....                          | 162 |
| Junglo .....                                  | 150 |
| Grassy species .....                          | 12  |
| Marsh and water species .....                 | 14  |
| Total Coco Island species ...                 | 358 |

The subjoined table exhibits the relationship that subsists between the systematic disposition of the species and their habit and habitat.

TABLE V. - *Relationship between systematic arrangement, habit and habitat.*

| HABIT. |                    |         |        |                   | SYSTEMATIC ARRANGEMENT. | HABITAT. |            |                     |         |            |               |        |
|--------|--------------------|---------|--------|-------------------|-------------------------|----------|------------|---------------------|---------|------------|---------------|--------|
| Total. | Climbers.<br>Trees | Shrubs. | Herbs. | Cultivated<br>sp. |                         | Weeds.   | Forest sp. | Marsh.<br>Littoral. | Marine. | Epiphytic. | Parasiticete. | Total. |
| 1      | 1                  |         |        |                   | Anonacææ                |          | 1          |                     |         |            |               | 1      |
| 2      | 2                  |         |        |                   | Monispermaceæ           |          | 2          |                     |         |            |               | 2      |
| 1      |                    |         | 1      |                   | Nymphaeaceæ             |          |            | 1                   |         |            |               | 1      |
| 2      | 2                  |         |        |                   | Capparidææ              |          | 2          |                     |         |            |               | 2      |
| 1      | 1                  |         |        |                   | Violacææ                |          | 1          |                     |         |            |               | 1      |
| 2      | 2                  |         |        |                   | Guttiferææ              |          | 1          |                     | 1       |            |               | 2      |
| 2      | 2                  |         |        |                   | Dipterocarpeææ          |          | 2          |                     |         |            |               | 2      |
| 8      | 3                  | 2       | 3      |                   | Malvacææ                | 2        | 2          |                     | 2       |            |               | 8      |
| 8      | 1                  | 7       |        |                   | Sterculiacææ            | 2        | 6          |                     | 2       |            |               | 8      |
| 4      |                    | 1       | 3      |                   | Tiliacææ                |          | 4          |                     |         |            |               | 4      |
| 1      |                    |         | 1      |                   | Rutacææ                 |          | 1          |                     |         |            |               | 1      |
| 2      | 2                  |         |        |                   | Burseracææ              |          | 2          |                     |         |            |               | 2      |
| 4      | 4                  |         |        |                   | Meliacææ                |          | 3          |                     | 1       |            |               | 4      |
| 3      | 2                  | 1       |        |                   | Oleaceææ                |          | 3          |                     |         |            |               | 3      |
| 3      | 1                  | 1       | 1      |                   | Celastrinææ             |          | 2          |                     | 1       |            |               | 3      |
| 3      | 3                  |         |        |                   | Rhamnææ                 |          | 2          |                     | 1       |            |               | 3      |
| 5      | 3                  |         | 2      |                   | Ampelidææ               |          | 4          |                     | 1       |            |               | 5      |
| 5      | 4                  | 1       |        |                   | Sapindacææ              |          | 5          |                     |         |            |               | 5      |
| 6      | 6                  |         |        |                   | Anacardiaceææ           |          | 5          |                     | 1       |            |               | 6      |
| 1      | 1                  |         |        |                   | Moringææ                | 1        |            |                     |         |            |               | 1      |
| 1      | 1                  |         |        |                   | Connaracææ              |          | 1          |                     |         |            |               | 1      |
| 34     | 18                 | 6       | 7      | 3                 | Leguminosææ             | 3        | 2          | 19                  | 10      |            |               | 34     |
| 5      | 5                  |         |        |                   | Rhizophorææ             |          |            | 5                   |         |            |               | 5      |
| 5      | 1                  | 3       | 1      |                   | Combretaceææ            |          | 2          |                     | 3       |            |               | 5      |
| 2      | 2                  |         |        |                   | Myrtacææ                |          |            | 2                   |         |            |               | 2      |
| 1      |                    |         | 1      |                   | Melastomaceææ           |          | 1          |                     |         |            |               | 1      |
| 3      | 2                  | 1       |        |                   | Lythracææ               |          | 2          |                     | 1       |            |               | 3      |
| 2      | 1                  |         | 1      |                   | Passiflorææ             | 1        | 1          |                     |         |            |               | 2      |
| 1      | 1                  |         |        |                   | Cucurbitaceææ           |          | 1          |                     |         |            |               | 1      |
| 1      |                    |         | 1      |                   | Ficoideææ               |          |            | 1                   |         |            |               | 1      |
| 13     | 2                  | 6       | 5      |                   | Rubiaceææ               |          | 0          |                     | 4       |            |               | 13     |
| 7      | 1                  |         | 5      |                   | Compositæææ             | 3        | 2          |                     | 2       |            |               | 7      |
| 1      |                    |         | 1      |                   | Goodenovicæææ           |          |            | 1                   |         |            |               | 1      |
| 2      | 2                  |         |        |                   | Myrsinæææ               |          |            | 1                   |         |            |               | 2      |
| 1      | 1                  |         |        |                   | Sapotacæææ              |          |            | 1                   |         |            |               | 1      |
| 1      | 1                  |         |        |                   | Ebenacæææ               |          | 1          |                     |         |            |               | 1      |
| 7      | 2                  | 2       | 2      | 1                 | Apocynæææ               |          | 4          |                     | 3       |            |               | 7      |
| 4      | 4                  |         |        |                   | Asclepiadacæææ          |          |            |                     | 1       |            | 3             | 4      |
| 1      |                    |         | 1      |                   | Gentianacæææ            |          |            | 1                   |         |            |               | 1      |
| 2      | 2                  |         |        |                   | Boraginæææ              |          |            |                     |         |            |               | 2      |
| 14     | 14                 |         |        |                   | Convolvulacæææ          | 2        | 3          |                     | 9       |            |               | 14     |
| 3      |                    | 1       | 2      |                   | Solanacæææ              | 2        |            |                     | 1       |            |               | 3      |
| 1      |                    |         | 1      |                   | Scrophularinæææ         |          | 1          |                     |         |            |               | 1      |
| 2      | 2                  |         |        |                   | Bignoniaceæææ           |          | 2          |                     |         |            |               | 2      |
| 7      | 1                  |         | 6      |                   | Acanthaceæææ            | 1        | 3          | 1                   | 2       |            |               | 7      |



| HABIT. |           |        |         |        | SYSTEMATIC ARRANGEMENT. | HABITAT.       |        |            |        |           |         |            |              |        |
|--------|-----------|--------|---------|--------|-------------------------|----------------|--------|------------|--------|-----------|---------|------------|--------------|--------|
| Total. | Climbers. | Trees. | Shrubs. | Herbs. |                         | Cultivated sp. | Weeds. | Forest sp. | Marsh. | Littoral. | Marine. | Epiphytic. | Parasiticae. | Total. |
| 8      | 2         | 3      | 2       | 1      | Verbenaceæ ...          | ...            | ...    | 2          | 1      | 5         | ...     | ...        | ...          | 8      |
| 1      | ...       | ...    | ...     | 1      | Labiatae ...            | ...            | ...    | ...        | 1      | ...       | ...     | ...        | ...          | 1      |
| 3      | 1         | 1      | ...     | 1      | Nyctaginæ ...           | ...            | ...    | ...        | ...    | 3         | ...     | ...        | ...          | 3      |
| 3      | ...       | ...    | 3       | ...    | Amarantaceæ ...         | ...            | 2      | 1          | ...    | ...       | ...     | ...        | ...          | 3      |
| 1      | ...       | ...    | 1       | ...    | Polygonaceæ ...         | ...            | ...    | ...        | 1      | ...       | ...     | ...        | ...          | 1      |
| 2      | 1         | ...    | ...     | 1      | Aristolochiaceæ ...     | ...            | ...    | 2          | ...    | ...       | ...     | ...        | ...          | 2      |
| 1      | 1         | ...    | ...     | ...    | Piperaceæ ...           | ...            | ...    | 1          | ...    | ...       | ...     | ...        | ...          | 1      |
| 2      | ...       | 2      | ...     | ...    | Myristicææ ...          | ...            | ...    | 2          | ...    | ...       | ...     | ...        | ...          | 2      |
| 3      | 1         | 2      | ...     | ...    | Laurinææ ...            | ...            | ...    | 1          | ...    | 1         | ...     | 1          | ...          | 3      |
| 1      | ...       | ...    | 1       | ...    | Loranthaceæ ...         | ...            | ...    | ...        | ...    | ...       | ...     | 1          | ...          | 1      |
| 1      | ...       | 1      | ...     | ...    | Santalaceæ ...          | ...            | ...    | ...        | ...    | 1         | ...     | ...        | ...          | 1      |
| 15     | ...       | 13     | 2       | ...    | Euphorbiaceæ ...        | ...            | ...    | 1          | 13     | 1         | ...     | ...        | ...          | 15     |
| 11     | 1         | 10     | ...     | ...    | Urticaceæ ...           | ...            | ...    | 11         | ...    | ...       | ...     | ...        | ...          | 11     |
| 1      | ...       | 1      | ...     | ...    | Cycadaceæ ...           | ...            | ...    | ...        | 1      | ...       | ...     | ...        | ...          | 1      |
| 5      | ...       | ...    | 5       | ...    | Orchidaceæ ...          | ...            | ...    | 1          | ...    | ...       | 4       | ...        | ...          | 5      |
| 3      | ...       | ...    | 3       | ...    | Scitamineæ ...          | ...            | 1      | ...        | 2      | ...       | ...     | ...        | ...          | 3      |
| 1      | ...       | ...    | 1       | ...    | Amaryllidaceæ ...       | ...            | ...    | ...        | 1      | ...       | ...     | ...        | ...          | 1      |
| 1      | ...       | ...    | 1       | ...    | Taccaceæ ...            | ...            | ...    | ...        | 1      | ...       | ...     | ...        | ...          | 1      |
| 2      | 2         | ...    | ...     | ...    | Dioscoreaceæ ...        | ...            | ...    | 2          | ...    | ...       | ...     | ...        | ...          | 2      |
| 5      | 3         | 1      | 1       | ...    | Liliaceæ ...            | ...            | ...    | 4          | 1      | ...       | ...     | ...        | ...          | 5      |
| 3      | ...       | ...    | 3       | ...    | Commelynacææ ...        | ...            | ...    | 3          | ...    | ...       | ...     | ...        | ...          | 3      |
| 1      | 1         | ...    | ...     | ...    | Flagellariææ ...        | ...            | ...    | ...        | 1      | ...       | ...     | ...        | ...          | 1      |
| 6      | 2         | 3      | 1       | ...    | Palmææ ...              | ...            | 1      | ...        | 4      | 1         | ...     | ...        | ...          | 6      |
| 1      | ...       | 1      | ...     | ...    | Pandanaceæ ...          | ...            | ...    | ...        | 1      | ...       | ...     | ...        | ...          | 1      |
| 4      | 2         | ...    | 2       | ...    | Aroidææ ...             | ...            | ...    | 2          | ...    | ...       | 2       | ...        | ...          | 4      |
| 2      | ...       | ...    | 2       | ...    | Naiadaceæ ...           | ...            | ...    | ...        | 1      | 1         | ...     | ...        | ...          | 2      |
| 10     | ...       | 10     | ...     | ...    | Cyperaceæ ...           | ...            | ...    | 2          | 3      | 4         | 1       | ...        | ...          | 10     |
| 15     | ...       | 1      | 14      | ...    | Graminææ ...            | ...            | ...    | 5          | 6      | 2         | 2       | ...        | ...          | 15     |
| 10     | 2         | ...    | 8       | ...    | Filices ...             | ...            | ...    | 1          | 1      | ...       | ...     | 8          | ...          | 10     |
| 1      | ...       | ...    | 1       | ...    | Characeæ ...            | ...            | ...    | ...        | 1      | ...       | ...     | ...        | ...          | 1      |
| 2      | ...       | ...    | 2       | ...    | Musci ...               | ...            | ...    | ...        | ...    | ...       | 2       | ...        | ...          | 2      |
| 2      | ...       | ...    | 2       | ...    | Hepaticææ ...           | ...            | ...    | ...        | ...    | ...       | 2       | ...        | ...          | 2      |
| 4      | ...       | ...    | 4       | ...    | Lichenes ...            | ...            | ...    | ...        | ...    | ...       | ...     | 4          | ...          | 4      |
| 24     | ...       | ...    | 24      | ...    | Fungi ...               | ...            | ...    | 1          | ...    | ...       | ...     | 23         | ...          | 24     |
| 18     | ...       | ...    | 18      | ...    | Algææ ...               | ...            | ...    | ...        | ...    | ...       | ...     | ...        | ...          | 18     |
| 358    | 78        | 94     | 48      | 138    | TOTALS                  | ...            | 15     | 18         | 56     | 14        | 80      | 19         | 21           | 358    |

In considering the distribution of the species in this list it has to be borne in mind that the islands in which they have been collected form an integral portion of the phytogeographic province of South-Eastern Asia—an area comprising the Indian Peninsula and Ceylon, the lower slopes of the Himalaya—particularly its eastern and central portion, South China, Indo-China and Malaya. To this area too apparently ought to be added, at least as regards many littoral species and many



| DISTRIBUTION IN S. E. ASIA. |        |           |                 |             |           |         | NAMES OF SPECIES.                         | GENERAL DISTRIBUTION. |             |            |            |          |
|-----------------------------|--------|-----------|-----------------|-------------|-----------|---------|---|-----------------------|-------------|------------|------------|----------|
| Westn. Section.             |        |           | Eastn. Section. |             |           |         |   | Africa.               | S. E. Asia. | Australia. | Polynesia. | America. |
| Ceylon.                     | India. | Himalaya. | S. China.       | Indo-China. | Andamans. | Malaya. |   |                       |             |            |            |          |
| x                           | x      | x         | x               | x           | x         | x       | Eriodendron anfractuosum ...              | x                     | x           | -          | -          | x        |
| -                           | x      | -         | -               | -           | x         | -       | Sterculia villosa ...                     | -                     | x           | -          | -          | -        |
| -                           | -      | -         | -               | -           | -         | -       | Sterculia rubiginosa var. glabrescens ... | -                     | -           | -          | -          | -        |
| -                           | x      | -         | -               | x           | x         | x       | Sterculia parviflora ...                  | -                     | x           | -          | -          | -        |
| -                           | x      | -         | -               | x           | x         | x       | Sterculia alata ...                       | -                     | x           | -          | -          | -        |
| -                           | -      | -         | -               | -           | x         | -       | Sterculia colorata ...                    | -                     | -           | -          | -          | -        |
| -                           | x      | -         | -               | x           | x         | x       | Sterculia campanulata ...                 | -                     | x           | -          | -          | -        |
| -                           | x      | -         | -               | -           | x         | -       | Heritiera littoralis ...                  | -                     | x           | x          | x          | -        |
| -                           | x      | -         | -               | -           | -         | -       | Buettneria andamanensis ...               | -                     | x           | -          | -          | -        |
| -                           | x      | -         | -               | -           | x         | x       | Berrya Ammonilla ...                      | -                     | x           | -          | -          | -        |
| -                           | x      | -         | -               | -           | x         | x       | Grewia levigata ...                       | -                     | x           | x          | -          | -        |
| -                           | x      | -         | -               | -           | x         | -       | Grewia calophylla ...                     | -                     | x           | -          | -          | -        |
| -                           | x      | -         | -               | -           | x         | x       | Grewia Microcos ...                       | -                     | x           | -          | -          | -        |
| -                           | -      | -         | -               | -           | x         | x       | Glycosmis pentaphylla ...                 | -                     | -           | x          | -          | -        |
| -                           | -      | -         | -               | -           | x         | x       | Garuga pinnata ...                        | -                     | x           | -          | -          | -        |
| -                           | -      | -         | -               | -           | -         | -       | Canarium euphyllum ...                    | -                     | x           | -          | -          | -        |
| -                           | x      | -         | -               | -           | x         | x       | Aglaia andamanica ...                     | -                     | x           | -          | -          | -        |
| -                           | x      | -         | -               | -           | x         | x       | Amoora Rohituka ...                       | -                     | x           | -          | -          | -        |
| -                           | x      | -         | -               | -           | x         | x       | Carapa moluccensis ...                    | -                     | x           | x          | -          | -        |
| -                           | x      | -         | -               | -           | x         | x       | Chickrassia tubularis ...                 | -                     | -           | -          | x          | -        |
| -                           | -      | -         | -               | -           | x         | x       | Canajana Rheedii ...                      | -                     | x           | x          | -          | -        |
| -                           | -      | -         | -               | -           | -         | -       | Phlebocalymna Lobbiana ...                | -                     | x           | -          | -          | -        |
| -                           | -      | -         | -               | -           | -         | -       | Sarcostigma Wallichii ...                 | -                     | x           | -          | -          | -        |
| -                           | -      | -         | -               | -           | -         | -       | Glyptopetalum calcocarpum ...             | -                     | x           | -          | -          | -        |
| -                           | x      | -         | -               | -           | x         | x       | Salacia prinoides ...                     | -                     | x           | -          | -          | -        |
| -                           | -      | -         | -               | -           | -         | -       | Siphonodon celastrineus ...               | -                     | x           | -          | -          | -        |
| -                           | x      | -         | -               | -           | x         | x       | Ventilago calyculata ...                  | -                     | x           | -          | -          | -        |
| -                           | x      | -         | -               | -           | x         | x       | Zizyphus Oenopia ...                      | -                     | x           | x          | -          | -        |
| -                           | -      | -         | -               | -           | x         | x       | Colubrina asiatica ...                    | -                     | x           | x          | -          | -        |
| -                           | -      | -         | -               | -           | x         | -       | Vitis pentagona ...                       | -                     | -           | x          | -          | -        |
| -                           | x      | -         | -               | -           | x         | x       | Vitis carnosia ...                        | -                     | -           | x          | -          | -        |
| -                           | x      | -         | -               | -           | x         | x       | Vitis pedata ...                          | -                     | -           | x          | -          | -        |
| -                           | x      | -         | -               | -           | x         | x       | Leea sambucina ...                        | -                     | x           | x          | x          | -        |
| -                           | -      | -         | -               | -           | x         | x       | Leea hirta ...                            | -                     | x           | -          | -          | -        |
| -                           | x      | -         | -               | -           | x         | x       | Erioglossum edule ...                     | -                     | -           | x          | -          | -        |
| -                           | x      | -         | -               | -           | x         | -       | Allophylus Cobbe ...                      | -                     | -           | x          | -          | -        |
| -                           | -      | -         | -               | -           | -         | -       | Sapindus Dunura ...                       | -                     | -           | -          | -          | -        |
| -                           | x      | -         | -               | -           | x         | x       | Pometia tomentosa ...                     | -                     | -           | -          | -          | -        |
| -                           | x      | -         | -               | -           | x         | x       | Dodonaea viscosa ...                      | -                     | x           | x          | x          | -        |
| -                           | x      | -         | -               | -           | x         | -       | Odina Wodder ...                          | -                     | x           | -          | -          | -        |
| -                           | -      | -         | -               | -           | -         | -       | Parishia insignis ...                     | -                     | -           | -          | -          | -        |
| -                           | -      | -         | -               | -           | -         | -       | Semecarpus subpanduriformis ...           | -                     | -           | -          | -          | -        |
| -                           | -      | -         | -               | -           | x         | x       | Semecarpus heterophyllus ...              | -                     | -           | -          | -          | -        |
| -                           | -      | -         | -               | -           | x         | x       | Spondias mangifera ...                    | -                     | -           | -          | -          | -        |
| -                           | -      | -         | -               | -           | x         | x       | Gracontomelum mangiferum ...              | -                     | -           | -          | x          | -        |

| DISTRIBUTION IN S. E. ASIA. |        |           |                 |             |           |         | NAMES OF SPECIES.              | GENERAL DISTRIBUTION. |             |            |            |          |
|-----------------------------|--------|-----------|-----------------|-------------|-----------|---------|--------------------------------|-----------------------|-------------|------------|------------|----------|
| Westn. Section.             |        |           | Eastn. Section. |             |           |         |                                | Africa.               | S. E. Asia. | Australia. | Polynesia. | America. |
| Ceylon.                     | India. | Himalaya. | S. China.       | Indo-China. | Andamans. | Malaya. |                                |                       |             |            |            |          |
| x                           | x      | x         | x               | x           | x         | x       | <i>Moringa pterygosperma</i>   | ...                   | x           | [x]        | [x]        | [x]      |
| x                           | x      | x         | x               | x           | x         | x       | <i>Connarus gibbosus</i>       | ...                   | x           | x          | x          | x        |
| x                           | x      | x         | x               | x           | x         | x       | <i>Crotalaria sericea</i>      | ...                   | x           | x          | x          | x        |
| x                           | x      | x         | x               | x           | x         | x       | <i>Desmodium umbellatum</i>    | ...                   | x           | x          | x          | x        |
| x                           | x      | x         | x               | x           | x         | x       | <i>Desmodium triquetrum</i>    | ...                   | x           | x          | x          | x        |
| x                           | x      | x         | x               | x           | x         | x       | <i>Desmodium laxiflorum</i>    | ...                   | x           | x          | x          | x        |
| x                           | x      | x         | x               | x           | x         | x       | <i>Desmodium polycarpum</i>    | ...                   | x           | x          | x          | x        |
| x                           | x      | x         | x               | x           | x         | x       | <i>Desmodium triflorum</i>     | ...                   | x           | x          | x          | x        |
| x                           | x      | x         | x               | x           | x         | x       | <i>Alysicarpus vaginalis</i>   | ...                   | x           | x          | x          | x        |
| x                           | x      | x         | x               | x           | x         | x       | <i>Phaseolus</i> sp. ...       | ...                   | x           | x          | x          | x        |
| x                           | x      | x         | x               | x           | x         | x       | <i>Abrus precatorius</i>       | ...                   | x           | x          | x          | x        |
| x                           | x      | x         | x               | x           | x         | x       | <i>Abrus pulchellus</i>        | ...                   | x           | x          | x          | x        |
| x                           | x      | x         | x               | x           | x         | x       | <i>Erythrina indica</i>        | ...                   | [x]         | x          | x          | x        |
| x                           | x      | x         | x               | x           | x         | x       | <i>Mucuna gigantea</i>         | ...                   | [x]         | x          | x          | x        |
| x                           | x      | x         | x               | x           | x         | x       | <i>Mucuna pruriens</i>         | ...                   | x           | x          | x          | x        |
| x                           | x      | x         | x               | [x]         | [x]       | x       | <i>Pueraria Candollei</i>      | ...                   | x           | x          | x          | x        |
| x                           | x      | x         | x               | x           | x         | x       | <i>Pueraria phaseoloides</i>   | ...                   | x           | x          | x          | x        |
| x                           | x      | x         | x               | x           | x         | x       | <i>Canavalia obtusifolia</i>   | ...                   | x           | x          | x          | x        |
| x                           | x      | x         | x               | x           | x         | x       | <i>Vigna lutea</i>             | ...                   | x           | x          | x          | x        |
| x                           | x      | x         | x               | x           | x         | x       | <i>Pterocarpus indicus</i>     | ...                   | x           | x          | x          | x        |
| x                           | x      | x         | x               | x           | x         | x       | <i>Derris scandens</i> ...     | ...                   | x           | x          | x          | x        |
| x                           | x      | x         | x               | x           | x         | x       | <i>Derris sinuata</i> ...      | ...                   | x           | x          | x          | x        |
| x                           | x      | x         | x               | x           | x         | x       | <i>Derris uliginosa</i> ..     | ...                   | x           | x          | x          | x        |
| x                           | x      | x         | x               | x           | x         | x       | <i>Pongamia glabra</i>         | ...                   | [x]         | x          | x          | x        |
| x                           | x      | x         | x               | x           | x         | x       | <i>Sophora tomentosa</i>       | ...                   | x           | x          | x          | x        |
| x                           | x      | x         | x               | [x]         | x         | x       | <i>Mezoneuron enneaphyllum</i> | ...                   | x           | x          | x          | x        |
| x                           | x      | x         | x               | x           | x         | x       | <i>Cassalpinia Bonducella</i>  | ...                   | x           | x          | x          | x        |
| x                           | x      | x         | x               | x           | x         | x       | <i>Cassalpinia Nga</i>         | ...                   | x           | x          | x          | x        |
| x                           | x      | x         | x               | x           | x         | x       | <i>Tamarindus indica</i>       | ...                   | x           | x          | x          | x        |
| x                           | x      | x         | x               | [x]         | x         | x       | <i>Cynometra ramiflora</i>     | ...                   | x           | x          | x          | x        |
| x                           | x      | x         | x               | x           | x         | x       | <i>Entada scandens</i>         | ...                   | x           | x          | x          | x        |
| x                           | x      | x         | x               | x           | x         | x       | <i>Adenanthera pavonina</i>    | ...                   | x           | x          | x          | x        |
| x                           | x      | x         | x               | x           | x         | x       | <i>Acacia concinna</i>         | ...                   | x           | x          | x          | x        |
| x                           | x      | x         | x               | x           | x         | x       | <i>Acacia pennata</i> ...      | ...                   | x           | x          | x          | x        |
| x                           | x      | x         | x               | x           | x         | x       | <i>Albizia Lobbek</i> ...      | ...                   | x           | x          | x          | x        |
| x                           | x      | x         | x               | x           | x         | x       | <i>Albizia procera</i> ...     | ...                   | x           | x          | x          | x        |
| x                           | x      | x         | x               | x           | x         | x       | <i>Rhizophora mucronata</i>    | ...                   | x           | x          | x          | x        |
| x                           | x      | x         | x               | x           | x         | x       | <i>Rhizophora conjugata</i>    | ...                   | x           | x          | x          | x        |
| x                           | x      | x         | x               | x           | x         | x       | <i>Cerriops Candolleana</i>    | ...                   | x           | x          | x          | x        |
| x                           | x      | x         | x               | x           | x         | x       | <i>Cerriops Roxburghiana</i>   | ...                   | x           | x          | x          | x        |
| x                           | x      | x         | x               | x           | x         | x       | <i>Bruguiera gymnorhiza</i>    | ...                   | [x]         | x          | x          | x        |
| x                           | x      | x         | x               | x           | x         | x       | <i>Terminalia Catappa</i>      | ...                   | x           | x          | x          | x        |
| x                           | x      | x         | x               | [x]         | x         | x       | <i>Terminalia bialata</i>      | ...                   | x           | x          | x          | x        |
| x                           | x      | x         | x               | [x]         | x         | x       | <i>Lumnitzera racemosa</i>     | ...                   | x           | x          | x          | x        |
| x                           | x      | x         | x               | x           | x         | x       | <i>Illigera Coriandenia</i>    | ...                   | x           | x          | x          | x        |
| x                           | [x]    | x         | x               | x           | x         | x       | <i>Gyrocarpus Jacquinii</i>    | ...                   | [x]         | x          | x          | x        |
| x                           | x      | x         | x               | x           | x         | x       | <i>Barringtonia speciosa</i>   | ...                   | [x]         | x          | x          | x        |

| DISTRIBUTION IN S. E. ASIA. |        |           |                 |             |           |         | GENERAL DISTRIBUTION.    |         |             |            |            |          |
|-----------------------------|--------|-----------|-----------------|-------------|-----------|---------|--------------------------|---------|-------------|------------|------------|----------|
| Westn. Section.             |        |           | Eastn. Section. |             |           |         | NAMES OF SPECIES.        | Africa. | S. E. Asia. | Australia. | Polynesia. | America. |
| Ceylon.                     | India. | Himalaya. | S. China.       | Indo-China. | Andamans. | Malaya. |                          |         |             |            |            |          |
| x                           | x      |           |                 | x           | x         | x       | Barringtonia racemosa    | x       | x           |            | x          |          |
| x                           | x      |           |                 | x           | x         | x       | Memeceylon edule         | x       | x           |            | x          |          |
| x                           | x      |           |                 | x           | x         | x       | Pomphis acidula ...      | x       | x           |            | x          |          |
| x                           | x      |           |                 | x           | x         | x       | Lagerstroemia hypoleuca  | x       | x           |            | x          |          |
| x                           | x      |           |                 | x           | x         | x       | Lagerstroemia sp.        | x       | x           |            | x          |          |
| x                           | x      |           |                 | x           | x         | x       | Modoecca cordifolia      | x       | x           |            | x          |          |
| x                           | x      |           |                 | x           | x         | x       | Carica Papaya ...        | x       | x           |            | x          |          |
| x                           | x      |           |                 | x           | x         | x       | Trichosanthes palmata    | x       | x           |            | x          |          |
| x                           | x      |           |                 | x           | x         | x       | Sesuvium Portulacastrum  | x       | x           |            | x          |          |
| x                           | x      |           |                 | x           | x         | x       | Stephegyno diversifolia  | x       | x           |            | x          |          |
| x                           | x      |           |                 | x           | x         | x       | Mussaenda calycina       | x       | x           |            | x          |          |
| x                           | x      |           |                 | x           | x         | x       | Weberia Kurzii ...       | x       | x           |            | x          |          |
| x                           | x      |           |                 | x           | x         | x       | Randia longiflora        | x       | x           |            | x          |          |
| x                           | x      |           |                 | x           | x         | x       | Diplospora singularis    | x       | x           |            | x          |          |
| x                           | x      |           |                 | x           | x         | x       | Guettarda speciosa       | x       | x           |            | x          |          |
| x                           | x      |           |                 | x           | x         | x       | Ixora grandiflora var.   | x       | x           |            | x          |          |
| x                           | x      |           |                 | x           | x         | x       | Kurziana ...             | x       | x           |            | x          |          |
| x                           | x      |           |                 | x           | x         | x       | Ixora brunneoscens       | x       | x           |            | x          |          |
| x                           | x      |           |                 | x           | x         | x       | Ixora cuneifolia ...     | x       | x           |            | x          |          |
| x                           | x      |           |                 | x           | x         | x       | Pavetta indica ...       | x       | x           |            | x          |          |
| x                           | x      |           |                 | x           | x         | x       | Morinda citrifolia var.  | x       | x           |            | x          |          |
| x                           | x      |           |                 | x           | x         | x       | bracteata ...            | x       | x           |            | x          |          |
| x                           | x      |           |                 | x           | x         | x       | Psychotria adenophylla   | x       | x           |            | x          |          |
| x                           | x      |           |                 | x           | x         | x       | Pæderia foetida ...      | x       | x           |            | x          |          |
| x                           | x      |           |                 | x           | x         | x       | Vernonia cinerea         | x       | x           |            | x          |          |
| x                           | x      |           |                 | x           | x         | x       | Vernonia divergens       | x       | x           |            | x          |          |
| x                           | x      |           |                 | x           | x         | x       | Adenostemma viscosum     | x       | x           |            | x          |          |
| x                           | x      |           |                 | x           | x         | x       | Ageratum conyzoides      | x       | x           |            | x          |          |
| x                           | x      |           |                 | x           | x         | x       | Blumea virens ...        | x       | x           |            | x          |          |
| x                           | x      |           |                 | x           | x         | x       | Pluchea indica           | x       | x           |            | x          |          |
| x                           | x      |           |                 | x           | x         | x       | Wedelia scandens         | x       | x           |            | x          |          |
| x                           | x      |           |                 | x           | x         | x       | Scaevola Koenigii        | x       | x           |            | x          |          |
| x                           | x      |           |                 | x           | x         | x       | Ardisia humilis ...      | x       | x           |            | x          |          |
| x                           | x      |           |                 | x           | x         | x       | Egiceras majus ...       | x       | x           |            | x          |          |
| x                           | x      |           |                 | x           | x         | x       | Mimusops littoralis      | x       | x           |            | x          |          |
| x                           | x      |           |                 | x           | x         | x       | Diospyros Kurzii         | x       | x           |            | x          |          |
| x                           | x      |           |                 | x           | x         | x       | Rauwolfia serpentina     | x       | x           |            | x          |          |
| x                           | x      |           |                 | x           | x         | x       | Cerbera Odollam          | x       | x           |            | x          |          |
| x                           | x      |           |                 | x           | x         | x       | Ochrosia borbonica       | x       | x           |            | x          |          |
| x                           | x      |           |                 | x           | x         | x       | Tabernaemontana crispata | x       | x           |            | x          |          |
| x                           | x      |           |                 | x           | x         | x       | Strophanthus Wallichii   | x       | x           |            | x          |          |
| x                           | x      |           |                 | x           | x         | x       | Anodendron paniculatum   | x       | x           |            | x          |          |
| x                           | x      |           |                 | x           | x         | x       | Chonemorpha macrophylla  | x       | x           |            | x          |          |
| x                           | x      |           |                 | x           | x         | x       | Sarcobolus globosus      | x       | x           |            | x          |          |
| x                           | x      |           |                 | x           | x         | x       | Hoya parviflora ...      | x       | x           |            | x          |          |
| x                           | x      |           |                 | x           | x         | x       | Hoya diversifolia        | x       | x           |            | x          |          |
| x                           | x      |           |                 | x           | x         | x       | Dischidia nummularia     | x       | x           |            | x          |          |



| DISTRIBUTION IN S. E. ASIA. |        |           |               |             |           |         | NAMES OF SPECIES.            | GENERAL DISTRIBUTION. |             |            |            |          |
|-----------------------------|--------|-----------|---------------|-------------|-----------|---------|------------------------------|-----------------------|-------------|------------|------------|----------|
| Westn. Sectn.               |        |           | Eastn. Sectn. |             |           |         |                              | Africa:               | S. E. Asia. | Australia. | Polynesia. | America. |
| Ceylon.                     | India. | Himalaya. | S. China.     | Indo-China. | Andamans. | Malaya. |                              |                       |             |            |            |          |
| x                           | x      | —         | —             | x           | x         | x       | Achyranthes aspera var. por- |                       |             |            |            |          |
| x                           | x      | x         | x             | x           | x         | x       | phyristachya ...             | ...                   | —           | x          | x          |          |
| x                           | x      | x         | x             | x           | x         | x       | Gomphrena globosa            | ...                   | x           | x          | x          | x        |
| x                           | x      | x         | x             | x           | x         | x       | Polygonum barbatum           | ...                   | x           | x          | x          | x        |
| x                           | x      | x         | x             | x           | x         | x       | Bragantia tomentosa          | ...                   | —           | x          | —          | —        |
| x                           | x      | x         | x             | x           | x         | x       | Aristolochia tagala          | ...                   | —           | x          | —          | —        |
| x                           | x      | —         | —             | [x]         | x         | x       | Piper caninum ...            | ...                   | —           | x          | —          | —        |
| x                           | x      | —         | —             | [x]         | x         | x       | Myristica Irya ...           | ...                   | —           | x          | —          | —        |
| x                           | x      | —         | —             | —           | x         | x       | Myristica glauca ...         | ...                   | —           | x          | —          | —        |
| x                           | x      | —         | x             | x           | x         | x       | Dehaasia Kurzii ...          | ...                   | —           | —          | —          | —        |
| x                           | x      | x         | x             | x           | x         | x       | Hernandia peltata            | ...                   | [x]         | x          | x          | x        |
| x                           | x      | x         | x             | x           | x         | x       | Cassylta filiformis          | ...                   | —           | x          | x          | x        |
| x                           | x      | —         | —             | —           | x         | x       | Loranthus longiflorus        | ...                   | —           | x          | —          | —        |
| x                           | x      | —         | —             | [x]         | x         | x       | Champercia Griffithiana      | ...                   | —           | x          | —          | —        |
| x                           | x      | —         | x             | x           | x         | x       | Euphorbia Atoto ...          | ...                   | —           | x          | x          | x        |
| x                           | x      | —         | x             | x           | x         | x       | Euphorbia pilulifera         | ...                   | x           | x          | x          | x        |
| x                           | x      | —         | x             | x           | x         | x       | Bridelia Kurzii ...          | ...                   | —           | x          | —          | —        |
| x                           | x      | x         | x             | x           | x         | x       | Bridelia tomentosa           | ...                   | —           | x          | x          | x        |
| x                           | x      | —         | [x]           | [x]         | [x]       | —       | Phyllanthus columnaris       | ...                   | —           | x          | —          | —        |
| x                           | x      | x         | x             | x           | x         | x       | Phleggia microcarpa          | ...                   | x           | x          | x          | x        |
| x                           | x      | —         | —             | x           | x         | —       | Cyclostemon assamicus        | ...                   | —           | x          | —          | —        |
| x                           | x      | —         | —             | [x]         | x         | —       | Aporosa villosula            | ...                   | —           | x          | —          | —        |
| x                           | x      | —         | —             | [x]         | x         | —       | Croton sublyratus            | ...                   | —           | x          | —          | —        |
| x                           | x      | —         | —             | —           | x         | —       | Blachia andamanica           | ...                   | —           | x          | —          | —        |
| x                           | x      | —         | —             | —           | x         | x       | Claoxylon longifolium        | ...                   | —           | x          | —          | —        |
| x                           | x      | —         | —             | [x]         | x         | x       | Mallotus acuminatus          | ...                   | —           | x          | —          | —        |
| x                           | x      | —         | —             | —           | x         | —       | Mallotus andamanicus         | ...                   | —           | x          | —          | —        |
| x                           | x      | —         | —             | —           | x         | x       | Macaranga Tanarius           | ...                   | —           | x          | —          | —        |
| x                           | x      | —         | —             | —           | x         | x       | Cnesmone javanica            | ...                   | —           | x          | —          | —        |
| x                           | x      | —         | —             | [x]         | x         | —       | Phyllochlamys spinosa        | ...                   | —           | x          | —          | —        |
| x                           | x      | x         | —             | [x]         | x         | —       | Plecospermum andamanicum     | ...                   | —           | x          | —          | —        |
| x                           | x      | x         | —             | x           | x         | x       | Ficus Benjaminia ...         | ...                   | —           | x          | x          | —        |
| x                           | x      | x         | —             | x           | x         | x       | Ficus Rumphii ...            | ...                   | —           | x          | —          | —        |
| x                           | x      | x         | —             | x           | x         | x       | Ficus retusa var. nitida     | ...                   | —           | x          | x          | —        |
| x                           | x      | —         | —             | —           | x         | x       | Ficus breviscapis ...        | ...                   | —           | x          | —          | —        |
| x                           | x      | —         | —             | x           | x         | x       | Ficus callosa ...            | ...                   | —           | x          | —          | —        |
| x                           | x      | x         | x             | x           | x         | x       | Ficus hispida ...            | ...                   | —           | x          | x          | —        |
| x                           | x      | —         | —             | [x]         | [x]       | —       | Ficus grisea ...             | ...                   | —           | x          | —          | —        |
| x                           | x      | —         | —             | —           | x         | x       | Antiaris toxicaria           | ...                   | —           | x          | —          | —        |
| x                           | x      | —         | —             | —           | x         | x       | Artocarpus Gomeziana         | ...                   | —           | x          | —          | —        |
| x                           | x      | —         | —             | [x]         | x         | x       | Cycas Rumphii ...            | ...                   | —           | x          | x          | —        |
| x                           | x      | —         | —             | —           | x         | x       | Dendrobium secundum          | ...                   | —           | x          | —          | —        |
| x                           | x      | x         | —             | x           | x         | x       | Calanthe veratrifolia        | ...                   | —           | x          | x          | —        |
| x                           | x      | x         | —             | x           | x         | x       | Dorites Wightii ...          | ...                   | —           | x          | —          | —        |
| x                           | x      | x         | —             | [x]         | [x]       | —       | Ardisia multiflorum          | ...                   | —           | x          | —          | —        |
| x                           | x      | x         | —             | x           | x         | x       | Pholidota imbricata          | ...                   | —           | x          | —          | —        |
| x                           | x      | x         | x             | x           | x         | x       | Costus speciosus ...         | ...                   | —           | x          | —          | —        |

| DISTRIBUTION IN S. E. ASIA. |        |           |               |             |           |         | GENERAL DISTRIBUTION.         |        |            |            |            |          |
|-----------------------------|--------|-----------|---------------|-------------|-----------|---------|-------------------------------|--------|------------|------------|------------|----------|
| Westn. Sectn.               |        |           | Eastn. Sectn. |             |           |         | NAMES OF SPECIES.             | Africa | S. E. Asia | Australia. | Polynesia. | America. |
| Ceylon.                     | India. | Himalaya. | S. China.     | Indo-China. | Andamans. | Malaya. |                               |        |            |            |            |          |
| x                           | x      | x         | x             | x           | x         | x       | Zingiber sp. ...              | x      | x          | x          | x          | x        |
| x                           | x      | x         | x             | x           | x         | x       | Musa sapientum ...            | x      | x          | x          | x          | x        |
| x                           | x      | x         | x             | x           | x         | x       | Crinum asiaticum              | x      | x          | x          | x          | x        |
| x                           | x      | x         | x             | x           | x         | x       | Tacca pinatifida ...          | x      | x          | x          | x          | x        |
| x                           | x      | x         | x             | x           | x         | x       | Dioscorea glabra ...          | x      | x          | x          | x          | x        |
| x                           | x      | x         | x             | x           | x         | x       | Dioscorea pentaphylla         | x      | x          | x          | x          | x        |
| x                           | x      | x         | x             | x           | x         | x       | Smilax macrophylla            | x      | x          | x          | x          | x        |
| x                           | x      | x         | x             | x           | x         | x       | Asparagus racemosus           | x      | x          | x          | x          | x        |
| x                           | x      | x         | x             | x           | x         | x       | Dracena angustifolia          | x      | x          | x          | x          | x        |
| x                           | x      | x         | x             | x           | x         | x       | Dracena spicata ...           | x      | x          | x          | x          | x        |
| x                           | x      | x         | x             | x           | x         | x       | Gloriosa superba ...          | x      | x          | x          | x          | x        |
| x                           | x      | x         | x             | x           | x         | x       | Pollia zorzogonensis          | x      | x          | x          | x          | x        |
| x                           | x      | x         | x             | x           | x         | x       | Commelina obliqua             | x      | x          | x          | x          | x        |
| x                           | x      | x         | x             | x           | x         | x       | Aneilema ovatum               | x      | x          | x          | x          | x        |
| x                           | x      | x         | x             | x           | x         | x       | Flagellaria indica            | x      | x          | x          | x          | x        |
| x                           | x      | x         | x             | x           | x         | x       | Caryota sobolifera            | x      | x          | x          | x          | x        |
| x                           | x      | x         | x             | x           | x         | x       | Corypha elata ...             | x      | x          | x          | x          | x        |
| x                           | x      | x         | x             | x           | x         | x       | Livistona sp. ...             | x      | x          | x          | x          | x        |
| x                           | x      | x         | x             | x           | x         | x       | Calamus tigrinus...           | x      | x          | x          | x          | x        |
| x                           | x      | x         | x             | x           | x         | x       | Calamus andamanicus           | x      | x          | x          | x          | x        |
| x                           | x      | x         | x             | x           | x         | x       | Cocos nucifera ...            | x      | x          | x          | x          | x        |
| x                           | x      | x         | x             | x           | x         | x       | Pandanus odoratissimus        | x      | x          | x          | x          | x        |
| x                           | x      | x         | x             | x           | x         | x       | Amorphophallus sp.            | x      | x          | x          | x          | x        |
| x                           | x      | x         | x             | x           | x         | x       | Alocasia fornicata            | x      | x          | x          | x          | x        |
| x                           | x      | x         | x             | x           | x         | x       | Scindapsus officinalis        | x      | x          | x          | x          | x        |
| x                           | x      | x         | x             | x           | x         | x       | Pothos scandens ...           | x      | x          | x          | x          | x        |
| x                           | x      | x         | x             | x           | x         | x       | Cymodocea ciliata             | x      | x          | x          | x          | x        |
| x                           | x      | x         | x             | x           | x         | x       | Zanichellia palustris         | x      | x          | x          | x          | x        |
| x                           | x      | x         | x             | x           | x         | x       | Cyperus polystachyus          | x      | x          | x          | x          | x        |
| x                           | x      | x         | x             | x           | x         | x       | Cyperus elegans ...           | x      | x          | x          | x          | x        |
| x                           | x      | x         | x             | x           | x         | x       | Cyperus dilutus ...           | x      | x          | x          | x          | x        |
| x                           | x      | x         | x             | x           | x         | x       | Cyperus pennatus              | x      | x          | x          | x          | x        |
| x                           | x      | x         | x             | x           | x         | x       | Kyllinga brevifolia           | x      | x          | x          | x          | x        |
| x                           | x      | x         | x             | x           | x         | x       | Fimbristylis diphylla         | x      | x          | x          | x          | x        |
| x                           | x      | x         | x             | x           | x         | x       | Fimbristylis ferruginea       | x      | x          | x          | x          | x        |
| x                           | x      | x         | x             | x           | x         | x       | Fimbristylis quinqueangularis | x      | x          | x          | x          | x        |
| x                           | x      | x         | x             | x           | x         | x       | Fimbristylis miliacea         | x      | x          | x          | x          | x        |
| x                           | x      | x         | x             | x           | x         | x       | Scirpus subulatus             | x      | x          | x          | x          | x        |
| x                           | x      | x         | x             | x           | x         | x       | Paspalum scrobiculatum        | x      | x          | x          | x          | x        |
| x                           | x      | x         | x             | x           | x         | x       | Panicum ciliare ...           | x      | x          | x          | x          | x        |
| x                           | x      | x         | x             | x           | x         | x       | Panicum colonum               | x      | x          | x          | x          | x        |
| x                           | x      | x         | x             | x           | x         | x       | Panicum Helopus               | x      | x          | x          | x          | x        |
| x                           | x      | x         | x             | x           | x         | x       | Panicum javanicum             | x      | x          | x          | x          | x        |
| x                           | x      | x         | x             | x           | x         | x       | Panicum Myurus ..             | x      | x          | x          | x          | x        |
| x                           | x      | x         | x             | x           | x         | x       | Panicum montanum              | x      | x          | x          | x          | x        |
| x                           | x      | x         | x             | x           | x         | x       | Oplismenus compositus         | x      | x          | x          | x          | x        |
| x                           | x      | x         | x             | x           | x         | x       | Thuarea sarmentosa            | x      | x          | x          | x          | x        |



| DISTRIBUTION IN S. E. ASIA. |        |           |           |               |           |         |                            | . NAMES OF SPECIES. | GENERAL DISTRIBUTION. |             |            |            |          |
|-----------------------------|--------|-----------|-----------|---------------|-----------|---------|----------------------------|---------------------|-----------------------|-------------|------------|------------|----------|
| Westn. Sectn.               |        |           |           | Eastn. Sectn. |           |         |                            |                     | Africa.               | S. E. Asia. | Australia. | Polynesia. | America. |
| Ceylon.                     | India. | Himalaya. | S. China. | Indo-China.   | Andamans. | Malaya. |                            |                     |                       |             |            |            |          |
| x                           | x      | x         | x         | x             | x         | x       | Ischæmum ciliaro           | ...                 | —                     | x           | x          | —          | —        |
| x                           | x      | x         | x         | x             | x         | x       | Ischæmum muticum           | ...                 | —                     | x           | x          | —          | —        |
| x                           | x      | x         | x         | x             | x         | x       | Andropogon contortus       | ...                 | x                     | x           | x          | x          | x        |
| x                           | x      | x         | x         | x             | x         | x       | Elenis indica              | ...                 | x                     | x           | x          | x          | x        |
| x                           | x      | x         | x         | x             | x         | x       | Elenis ægyptiaca           | ...                 | x                     | x           | x          | x          | x        |
| —                           | —      | x         | x         | x             | x         | x       | Dendrocalamus strictus     | ...                 | —                     | x           | x          | x          | —        |
| x                           | x      | x         | x         | x             | x         | x       | Davallia solida            | ...                 | —                     | x           | x          | x          | —        |
| x                           | x      | x         | x         | x             | x         | x       | Adiantum lunulatum         | ...                 | x                     | x           | x          | x          | x        |
| x                           | x      | x         | x         | x             | x         | x       | Ceratopteris thalictroides | ...                 | x                     | x           | x          | x          | x        |
| x                           | x      | x         | x         | x             | x         | x       | Polypodium irioides        | ...                 | x                     | x           | x          | x          | —        |
| x                           | x      | x         | x         | x             | x         | x       | Polypodium adnascens       | ...                 | —                     | x           | x          | x          | —        |
| x                           | x      | x         | x         | x             | x         | x       | Polypodium quercifolium    | ...                 | —                     | x           | x          | x          | —        |
| x                           | x      | x         | x         | x             | x         | x       | Vittaria elongata          | ...                 | —                     | x           | x          | x          | —        |
| x                           | x      | x         | x         | x             | x         | x       | Acrostichum scandens       | ...                 | —                     | x           | x          | x          | —        |
| x                           | x      | x         | x         | x             | x         | x       | Acrostichum appendiculatum | ...                 | —                     | x           | —          | —          | —        |
| x                           | x      | x         | x         | x             | x         | x       | Lygodium flexuosum         | ...                 | x                     | x           | x          | —          | —        |
| x                           | x      | x         | x         | x             | x         | x       | Chnra foetida              | ...                 | —                     | x           | —          | —          | —        |
| x                           | x      | —         | x         | x             | x         | x       | Calymperes Dozyanum        | ...                 | —                     | x           | —          | x          | —        |
| x                           | x      | x         | x         | x             | x         | x       | Bryum coronatum            | ...                 | —                     | x           | x          | x          | x        |
| —                           | —      | —         | —         | —             | —         | —       | Lejennia sp.               | ...                 | —                     | x           | —          | —          | —        |
| x                           | x      | x         | x         | x             | x         | x       | Collema nigrescens         | ...                 | —                     | x           | x          | x          | x        |
| —                           | —      | —         | —         | —             | —         | —       | Physcia obscura ?          | ...                 | —                     | x           | x          | x          | x        |
| —                           | —      | —         | —         | —             | —         | —       | Physcia sp.                | ...                 | —                     | —           | —          | —          | —        |
| —                           | —      | —         | —         | —             | —         | —       | Lepraria sp.               | ...                 | —                     | x           | —          | —          | —        |
| x                           | x      | x         | —         | x             | x         | x       | Lentinus leucochrous       | ...                 | —                     | x           | —          | —          | —        |
| x                           | x      | x         | —         | x             | x         | x       | Lenzites deplanata         | ...                 | —                     | x           | —          | —          | —        |
| —                           | —      | —         | —         | —             | —         | —       | Lenzites subferruginea     | ...                 | —                     | —           | —          | —          | —        |
| x                           | x      | x         | x         | x             | x         | x       | Polyporus fulvus           | ...                 | —                     | x           | —          | —          | —        |
| x                           | x      | x         | x         | x             | x         | x       | Polyporus xanthopus        | ...                 | —                     | x           | x          | x          | x        |
| x                           | x      | x         | x         | x             | x         | x       | Polyporus sanguineus       | ...                 | —                     | x           | x          | x          | x        |
| x                           | x      | x         | x         | x             | x         | x       | Polyporus grammatocephalus | ...                 | —                     | x           | x          | —          | x        |
| x                           | x      | x         | x         | x             | x         | x       | Polyporus australis        | ...                 | —                     | x           | x          | x          | x        |
| —                           | —      | —         | —         | —             | —         | —       | Hexagona pergamenea        | ...                 | —                     | x           | —          | —          | —        |
| —                           | —      | —         | —         | —             | —         | —       | Hexagona sericeo-hirsuta   | ...                 | —                     | x           | —          | —          | x        |
| —                           | —      | —         | —         | —             | —         | —       | Hexagona tenuis            | ...                 | —                     | x           | —          | —          | —        |
| —                           | —      | —         | —         | —             | —         | —       | Dedalea flabellum          | ...                 | —                     | x           | —          | —          | —        |
| x                           | x      | x         | x         | x             | x         | x       | Dedalea sanguinea          | ...                 | —                     | x           | —          | —          | —        |
| x                           | x      | x         | x         | x             | x         | x       | Dedalea quercina           | ...                 | —                     | x           | x          | x          | x        |
| x                           | x      | x         | x         | x             | x         | x       | Dedalea concentrica        | ...                 | —                     | x           | x          | x          | x        |
| x                           | x      | x         | x         | x             | x         | x       | Thelephora incrustans      | ...                 | —                     | x           | x          | x          | x        |
| x                           | x      | x         | x         | x             | x         | x       | Bovista lilacina           | ...                 | —                     | x           | x          | x          | x        |
| x                           | x      | —         | —         | —             | —         | —       | Hirneola polytricha        | ...                 | —                     | x           | x          | x          | x        |
| —                           | —      | —         | —         | —             | —         | —       | Xylaria clavarioides       | ...                 | —                     | x           | —          | —          | —        |
| —                           | —      | —         | —         | —             | —         | —       | Daldinia verrucosa         | ...                 | —                     | —           | —          | —          | x        |
| —                           | —      | —         | —         | —             | —         | —       | Rhytisma sp.               | ...                 | —                     | x           | —          | —          | —        |
| x                           | x      | —         | —         | —             | —         | —       | Sargassum ilicifolium      | ...                 | —                     | x           | —          | x          | x        |
| —                           | —      | —         | —         | —             | —         | —       | Turbinaria ornata          | ...                 | —                     | x           | —          | —          | —        |

| DISTRIBUTION IN S. E. ASIA. |        |               |           |             |           |         | NAMES OF SPECIES.                | GENERAL DISTRIBUTION. |             |            |            |          |
|-----------------------------|--------|---------------|-----------|-------------|-----------|---------|----------------------------------|-----------------------|-------------|------------|------------|----------|
| Westn. Sectn.               |        | Eastn. Sectn. |           |             |           |         |                                  | Africa.               | S. E. Asia. | Australia. | Polynesia. | America. |
| Ceylon.                     | India. | Himalaya.     | S. China. | Indo-China. | Andamans. | Malaya. |                                  |                       |             |            |            |          |
| x                           | x      | x             | x         | x           | x         | x       | <i>Padina pavonia</i> ...        | ...                   | x           | x          | x          | x        |
| x                           | x      | x             | x         | x           | x         | x       | <i>Dictyota dichotoma</i>        | ...                   | x           | x          | x          | x        |
| x                           | x      | x             | x         | x           | x         | x       | <i>Lithothamnion polymorphum</i> | ...                   | x           | x          | x          | x        |
| x                           | x      | x             | x         | x           | x         | x       | <i>Acanthophora Thierii</i>      | ...                   | x           | x          | x          | x        |
| x                           | x      | x             | x         | x           | x         | x       | <i>Jania tenella</i> ...         | ...                   | x           | x          | x          | x        |
| x                           | x      | x             | x         | x           | x         | x       | <i>Gracilaria crassa</i> ...     | ...                   | x           | x          | x          | x        |
| x                           | x      | x             | x         | x           | x         | x       | <i>Gelidium corneum</i>          | ...                   | x           | x          | x          | x        |
| x                           | x      | x             | x         | x           | x         | x       | <i>Caulerpa clavifera</i>        | ...                   | x           | x          | x          | x        |
| x                           | x      | x             | x         | x           | x         | x       | <i>Caulerpa plummaris</i>        | ...                   | x           | x          | x          | x        |
| x                           | x      | x             | x         | x           | x         | x       | <i>Valonia fastigiata</i>        | ...                   | x           | x          | x          | x        |
| x                           | x      | x             | x         | x           | x         | x       | <i>Valonia confervoides</i>      | ...                   | x           | x          | x          | x        |
| x                           | x      | x             | x         | x           | x         | x       | <i>Halimeda Opuntia</i>          | ...                   | x           | x          | x          | x        |
| x                           | x      | x             | x         | x           | x         | x       | <i>Siphonocladus? filiformis</i> | ...                   | x           | x          | x          | x        |
| x                           | x      | x             | x         | x           | x         | x       | <i>Vaucheria</i> sp.             | ...                   | x           | x          | x          | x        |
| x                           | x      | x             | x         | x           | x         | x       | <i>Calothrix pulvinata</i>       | ...                   | x           | x          | x          | x        |

Reviewing the general distribution of the flora as given in TABLE VI, we find that of the 358 species, 70 are cosmopolitan in the tropics, 10 more are nearly so, 49 are more or less widely spread throughout the tropics of the old world, 41 extend from South-eastern Asia to Australasia, while 188 species are confined to South-eastern Asia. The sub-joined synoptic table indicates these distributional features more exactly and gives at the same time the relationship of this distribution both to the habit and to the habitat of the species.

TABLE VII. *Relationship of General Distribution to Habit and Habitat.*

| HABIT. |           |        |         |        | DISTRIBUTIONAL FEATURES.  | HABITAT.       |        |            |        |           |         |            |                           |        |  |
|--------|-----------|--------|---------|--------|---|----------------|--------|------------|--------|-----------|---------|------------|---------------------------|--------|--|
| TOTAL. | Climbers. | Trees. | Shrubs. | Herbs. |   | Cultivated sp. | Weeds. | Forest sp. | Marsh. | Littoral. | Marine. | Epiphytic. | Parasitic or Saprophytic. | TOTAL. |  |
| 70     | 14        | 5      | 2       | 49     | <i>Cosmopolitan in the tropics.</i><br>America, Africa, Asia, Australia, Polynesia ... .. | 12             | 16     | 6          | 6      | 12        | 8       | 2          | 8                         | 70     |  |
|        |           |        |         |        | <i>In tropics of both Hemispheres, but hardly cosmopolitan.</i>                           |                |        |            |        |           |         |            |                           |        |  |
| 3      | 1         | 1      | ...     | 1      | America, Africa, Asia, Australia ... ..   | ...            | ...    | ...        | ...    | 2         | ...     | ...        | 1                         | 3      |  |
| 2      | ...       | ...    | ...     | 2      | America, Africa, Asia, Polynesia ... ..   | ...            | ...    | ...        | ...    | ...       | 1       | ...        | 1                         | 2      |  |
| 3      | 1         | 1      | ...     | 1      | America, Africa, Asia ... ..  | ...            | ...    | 2          | ...    | ...       | ...     | ...        | 1                         | 3      |  |
| 2      | ...       | ...    | ...     | 2      | America, Asia ... ..  | ...            | ...    | ...        | ...    | ...       | ...     | ...        | 2                         | 2      |  |
|        |           |        |         |        | <i>Widely distributed in Eastern Hemispheres; not in America.</i>                         |                |        |            |        |           |         |            |                           |        |  |
| 29     | 7         | 13     | 4       | 5      | Africa, Asia, Australia, Polynesia ... ..   | ...            | ...    | 2          | ...    | 26        | ...     | 1          | ...                       | 29     |  |
| 12     | 1         | 3      | 3       | 5      | Africa, Asia, Australia ... ..  | ...            | ...    | 3          | 3      | 5         | 1       | ...        | ...                       | 12     |  |
| 2      | ...       | 1      | ...     | 1      | Africa, Asia, Polynesia ... ..  | ...            | ...    | ...        | ...    | 1         | ...     | 1          | ...                       | 2      |  |
| 6      | 1         | 1      | 2       | 2      | Africa, Asia ... ..   | ...            | ...    | 2          | 1      | 2         | 1       | ...        | ...                       | 6      |  |
|        |           |        |         |        | <i>Confined to Asia and Australasia.</i>  |                |        |            |        |           |         |            |                           |        |  |
| 15     | 2         | 2      | 3       | 8      | Asia, Australia, Polynesia ... ..   | ...            | ...    | ...        | ...    | 10        | 1       | 3          | 1                         | 15     |  |
| 23     | 8         | 7      | 6       | 2      | Asia, Australia ... ..  | ...            | ...    | 16         | ...    | 6         | ...     | 1          | ...                       | 23     |  |
| 3      | ...       | 1      | ...     | 2      | Asia, Polynesia .. ..   | ...            | ...    | 2          | ...    | ...       | ...     | 1          | ...                       | 3      |  |
| 188    | 43        | 59     | 28      | 58     | South-Eastern Asia only ... ..  | ...            | 3      | 2          | 129    | 4         | 16      | 7          | 12                        | 188    |  |
| 358    | 78        | 94     | 48      | 138    | TOTALS  | 15             | 18     | 162        | 14     | 30        | 19      | 21         | 29                        | 358    |  |

In discussing the phytogeographic distribution of these species within the province of South-Eastern Asia it is necessary to distinguish between the districts forming the Western section, *viz.*:—the lower Himalayan slopes with the plains at their foot, Peninsular India, and Ceylon—from the Eastern section, which comprises Southern China, Indo-China, Malaya, including the Philippines, New Guinea, and the coasts of Northern or Tropical Australia. Of the 358 species in the Coco Islands, which therefore necessarily all occur in the Eastern section, 252 species, or 70 per cent., are found in the Western section as well. Of the whole number 153 species, or 43 per cent., extend to Australia, whereas only 140, or 39 per cent., are known to occur in South China.

The following tables indicate the distribution of the species so far as these three portions of S. E. Asia are concerned.

TABLE VIII. *Distribution in S. E. Asia of the species extending from the Coco-group to Cis-gangetic India.*

|   |     |
|---|-----|
| In all three Cis-gangetic districts ( <i>Himalaya, India, Ceylon</i> ):—    | 134 |
| In China, Indo-China, Malaya, Australia                                     | 72  |
| In Indo-China, Malaya, Australia  | 9   |
| In China, Indo-China, Malaya  | 26  |
| In Indo-China, Malaya   | 24  |
| In China, Indo-China, Andamans  | 1   |
| In Indo-China, Andamans   | 2   |
| In <i>Himalaya and India</i> :  | 14  |
| In Indo-China, Malaya, Australia  | 1   |
| In China, Indo-China, Malaya  | 1   |
| In Indo-China, Malaya   | 7   |
| In China, Indo-China, Andamans  | 1   |
| In Indo-China, Andamans   | 3   |
| In Andamans   | 1   |
| In <i>India and Ceylon</i> :—   | 76  |
| In China, Indo-China, Malaya, Australia                                     | 33  |
| In Indo-China, Malaya, Australia  | 21  |
| In Indo-China, Malaya   | 15  |
| In Indo-China, Andamans   | 1   |
| In Andamans, Malaya, Australia  | 3   |
| In Andamans, Malaya   | 3   |
| In <i>Himalaya</i> :—   | 5   |
| In China, Indo-China, Malaya  | 1   |
| In Indo-China, Malaya   | 2   |
| In Indo-China, Andamans   | 2   |
| In <i>India</i> :—  | 13  |
| In Indo-China, Malaya, Australia  | 1   |
| In China, Indo-China, Malaya  | 1   |
| In Indo-China, Malaya   | 3   |
| In Indo-China, Andamans   | 3   |
| In Andamans, Malaya, Australia  | 2   |
| In Andamans   | 3   |
| In <i>Ceylon</i> :—   | 10  |
| In Indo-China, Malaya, Australia  | 1   |
| In Indo, China, Malaya  | 6   |
| In Andamans, Malaya   | 2   |
| In Andamans   | 1   |
| Total number of species extending from the Coco Group to Cis-gangetic India | 252 |

TABLE IX. *Distribution in S. E. Asia of the species extending from the Coco Group to China.*

|  |     |
|--|-----|
| Extending as far as <i>Australia</i> :—                          | 106 |
| In Indo-China, Malaya, Australia; <i>Himalaya, India, Ceylon</i> | 72  |
| In Indo-China, Malaya, Australia; <i>India, Ceylon</i>           | 33  |
| In Indo-China, Malaya, Australia                                 | 1   |
| Extending as far as <i>Malaya</i> :—                             | 31  |
| In Indo-China, Malaya; <i>Himalaya, India, Ceylon</i>            | 26  |
| In Indo-China, Malaya; <i>Himalaya, India</i>                    | 1   |
| In Indo-China, Malaya; <i>Himalaya</i>                           | 1   |
| In Indo-China, Malaya  | 3   |

|  |       |  |
|--|-------|--|
| Extending as far as the <i>Andamans</i> only:—                     | ..... |  |
| In Indo-China, Andamans; <i>Himalaya, India, Ceylon</i> .....      | 1     |  |
| In Indo-China, Andamans; <i>Himalaya, India</i> .....              | 1     |  |
| In Indo-China, Andamans; <i>India</i> .....                        | 1     |  |
| Total number of species extending from the Coco Group to China ... | 140   |  |

TABLE X. *Distribution in S. E. Asia of the species extending from the Coco Group to Australia.*

|  |       |     |
|--|-------|-----|
| Extending as far as <i>China</i> :—                                    | ..... | 106 |
| To Malaya, Indo-China, China; <i>Himalaya, India, Ceylon</i> .....     | 72    |     |
| To Malaya, Indo-China, China; <i>India, Ceylon</i> .....               | 33    |     |
| To Malaya, Indo-China, China .....                                     | 1     |     |
| Extending as far as <i>Indo-China</i> :—                               | ..... | 38  |
| To Malaya, Indo-China; <i>Himalaya, India, Ceylon</i> .....            | 9     |     |
| To Malaya, Indo-China; <i>Himalaya, India</i> .....                    | 1     |     |
| To Malaya, Indo-China; <i>India, Ceylon</i> .....                      | 21    |     |
| To Malaya, Indo-China; <i>India</i> .....                              | 1     |     |
| To Malaya, Indo-China; <i>Ceylon</i> .....                             | 2     |     |
| To Malaya, Indo-China .....  | 4     |     |
| Extending as far as the <i>Coco Group (Andamans)</i> only:—            | ..... | 9   |
| To Malaya, Andamans; <i>Ceylon, India</i> .....                        | 3     |     |
| To Malaya, Andamans; <i>Ceylon</i> .....                               | 1     |     |
| To Malaya, Andamans; <i>India</i> .....                                | 2     |     |
| To Malaya, Andamans .....  | 3     |     |
| Total number of species extending from the Coco Group to Australia ... | 153   |     |

The analysis of these species thus shows that the figures do not indicate any special connection either with China, with India, or with Australia; many of the species in these tables are cosmopolitan or nearly so, and thus possess no special phytogeographical interest. The number of species that extend from India, Ceylon or the Himalaya to the Andamans and no further, is only 23, or  $6\frac{1}{2}$  per cent. of the whole flora; this figure, therefore, more nearly represents what may be considered the peculiarly Indian element in the Flora of the Andamans. There are only three species that extend from South China to the Andamans and no further southwards, and as all three are found in India and may as readily be extensions from India to China as from China to India we may assert that there is no distinctive Chinese feature in the flora at all. Only 9 species extend upwards from Australia as far as the Andamans, but not as far as Indo-China; but all these are characteristic Malayan species and may just as well be considered extensions from Malaya to Australia as from Australia through Malaya to the Coco Islands. The occurrence of as many as 10 of the species in Ceylon and not in India would seem at first to indicate that there is some foundation for a remark by Mr. Kurz, already alluded to in connection with the vegetation of Diamond Island (*J. A. S. B.* lix, pt. 2, p. 290), concerning the presence of a Ceylon

element in the Andamans flora. But a consideration of that section of TABLE VIII in which they are detailed shows that they afford little corroboration of this hypothesis for there is only one species (*Dedalea flabellum*) restricted to the Andamans and Ceylon, and as this is a *Cryptogam*, too great a reliance ought not to be placed on the fact; Indian *Cryptogams*, other than ferns, have not as yet been assiduously collected and the occurrence here of this Ceylon species perhaps indicates rather a wide dispersion for it than any peculiar affinity of the flora of the group with that of Ceylon.

The general conclusion to which we are led by the evidence these tables afford is, that the flora of the Coco Group is almost purely Transgangeitic, and that while this is the case there is no appreciable Chinese or Australian element present. We have still to ascertain whether it is an Indo-Chinese or a Malayan element that prevails in the flora, and to what extent any independent element exists.

From their geographical position we have to look upon the Coco Islands as part of the Andaman Group: in one sense therefore all the Coco Island species are Andamanese. But there are as many as 30 of the species in the list,\* or about 8 per cent. of the flora, whose presence in the Andamans is due only to their having been found in the Coco Group. At the same time, however, it must be remembered that 19 species, or over 5 per cent. of the flora, are peculiar to the Andamans as a whole, not occurring either in Indo-China or in Malaya, while 24 more are only known as Indo-Chinese from their presence in Tenasserim.† Of these 24 Andamans-Tenasserim species, 22, or 6 per cent. of the flora, are confined to these two districts, only two of them extending even as far as the Malay Peninsula. The bearing of this peculiar distribution in the Andamans and in Tenasserim, but neither northward to Indo-China nor southward to Malaya, the writer has already had occasion to note;‡ it will be referred to again below in connection with the probable origin of the Coco Island flora. Another circumstance that must be borne in mind is that as yet very little is known of the flora of North Andaman, and it is not improbable that some of the 30 *Non-Andaman* Coco species will yet be found to occur in that island.§

\* Indicated in the list of distribution by [] brackets in the Andamans column.

† Indicated by [] brackets in the Indo-Chinese column.

‡ *Ann. Roy. Bot. Garden*, vol. iii, p. 236.

§ As an example of this possibility may be instanced *Dendrocalamus Strictus* which does not occur in South Andaman. Mr. Godwin-Austen, formerly of Port Blair, one of the very few officers who have ascended Saddle Peak, the highest point of North Andaman, has informed the writer that at one point in the ascent a Bamboo is met with quite different from the Bamboos near Port Blair; not very

Of the 358 species, 232, making 65 per cent. of the whole, occur at once in Indo-China, Malaya and the Andamans; 40 occur in Malaya and the Andamans, 8 of these extending to Tenasserim but not occurring in Burma or Siam (Indo-China proper); 22 occur in Indo-China but not in Malaya, 12 of them being present in the Andamans also; 40 occur in the Andamans without appearing either in Indo-China or in Malaya, though 8 of these appear in Tenasserim, which connects Indo-China with the Malay Peninsula, just as the Andamans connect Indo-China with the Malay Archipelago; 8 occur only in the Coco Islands and Tenasserim, and 13 are apparently confined to the Coco group. This last number is probably too high; some of these species, as well as some of those others for which the Coco locality is as yet the only record from the Andamans, may occur in North Andaman.

The following table gives the distribution of the species in these three districts as well as in the sub-district of Tenasserim:—

TABLE XII. *Distribution of Coco Island species in the Indo-Chinese and Malayan districts.*

## A.

Species extending from Coco Group to:—

|   |     |     |
|---|-----|-----|
| Indo-China, Tenasserim, Andamans, Malaya, ... | ... | 232 |
| Indo-China, Tenasserim, Malaya, ...           | ... | 2   |
| —, Tenasserim, Andamans, Malaya, ...          | ... | 8   |
| —, Tenasserim, Malaya, ...                    | ... | 1   |
| —, Andamans, Malaya, ...                      | ... | 32  |
| Indo-China, —, Andamans, —, ...               | ... | 12  |
| —, Tenasserim, Andamans, —, ...               | ... | 8   |
| Indo-China, —, —, —, ...                      | ... | 10  |
| —, Tenasserim, —, —, ...                      | ... | 8   |
| —, —, Andamans, —, ...                        | ... | 32  |

|   |     |     |
|---|-----|-----|
| Total species extending from Coco Group | ... | 845 |
| Species confined to Coco Group          | ... | 13  |

Total Coco Island species ... 358

|                                |     | No. of species. | percentage of flora. |
|--------------------------------|-----|-----------------|----------------------|
| B. Species occurring in:—      |     |                 |                      |
| Indo-China                     | ... | 256             | 71                   |
| Tenasserim                     | ... | 259             | 72                   |
| Andamans                       | ... | 32              | 90                   |
| Malaya                         | ... | 275             | 76                   |
| Species confined to Coco Group | ... | 13              | 3½                   |

This table therefore leads to the conclusion that phytogeographically

tall, but extremely hard and tough, and forming dense thickets very difficult to pass through—a general description agreeing very well with that of *Dendrocalamus strictus* as it occurs in Great Coco.

as well as physiographically the Coco Group forms an integral part of the Andamans. Further, it shows that of the possibly predominating elements in their flora, the Indo-Chinese element, as a whole, is slightly weaker even in that part of the Andamans nearest to Burma than is an element indicating a Tenasserim influence and an element indicating a Malayan influence. This seems strange when we recollect that not only do the Cocos form that part of the Andamans nearest to Burma but that there is a shallow ridge, at times raised into islands, along the line between the Cocos and the nearest point on the Burmese mainland, whereas Tenasserim is at the opposite side of a deep sea, while Malaya is separated from the opposite extremity of the Andaman group by a much greater distance and by much deeper straits than Burma is from the area under discussion.

In order, if possible, to account for this peculiarity of distribution, it becomes necessary to discuss the probable origin of the flora of the group.

The first step in such an inquiry is to ascertain the species in a flora that may possibly have been introduced and that do not therefore necessarily postulate for an isolated locality such as the Cocos any former connection with neighbouring land. It is, of course, evident that if a previous land connection be shown to be necessary to explain the presence of any species in the islands this same land connection would sufficiently explain the presence of most of the species that occur there without requiring the suggestion of any extraneous means of introduction. But until all the possibilities of introduction by means of physical agencies now at work under existing physiographical conditions are completely exhausted, we are not at liberty to assume the existence of dissimilar physiographical conditions or a different application of the present physical agencies.

There is, however, always great difficulty in deciding absolutely what species are indigenous and what species are introduced in any locality, and here no species will be considered "indigenous" for which it is possible to suggest in the remotest fashion any means of introduction. At the risk therefore of including among introduced species many that are probably quite entitled to be termed indigenous, the possibilities are discussed under the headings of the various active introducing agencies. As this involves a use of the terms "indigenous" and "introduced" somewhat different from the sense in which they are generally accepted, it seems better that the possibly introduced species be spoken of as "migrant"; and the certainly indigenous residuary species termed "remanent," many of the "migrant" species being doubtless perfectly "indigenous" in the generally received sense.

Even, within the group of "migrant" species difficulties often arise owing to certain species being assisted in one way from island to island



over intervening seas and in another way along continuous land. As an example may be mentioned *Gyrocarpus Jacquini*, whose progress from island to island is clearly a sea-assisted process, yet whose dispersal inland when it is once established is greatly aided by wind because of its curious dipteroid fruit. It might even be suggested that the wings of this fruit may be sufficient to account for its transmission across intervening seas; but no one who has carefully observed the fall of its fruits is likely to consider this possible. Another very pertinent instance is *Terminalia Catappa*, a species distributed by ocean currents over all the coasts of the Andaman Sea, but which nevertheless occurs far inland as well as on the beaches. The explanation of its inland dispersal is extremely simple, for rats and frugivorous bats are extremely fond of the fleshy part of its fruits while they leave uninjured the stone and kernel. Both these animals are apt when disturbed while eating to carry off in their mouths the fruit they may be devouring, ultimately dropping it some distance from the place where the parent tree grew. But though bats occur in far off lonely islands like Batti Malv and Barren Island, and though their presence there indicates the possibility that animals of the kind may, like fruit-eating birds, carry undigested seeds from one island to another, it is clear, since they do not swallow the stones of *Terminalia Catappa* that they are not to be held responsible for the passage of that species across intervening seas. The further spread of these species within new localities by agencies quite distinct from that necessary to account for their initial appearance is, it will be admitted, amply demonstrated.\* Other examples are *Pisonia aculeata* and *excelsa* which are perhaps introduced by the sea along these coasts. If they are, however, it is quite certain that their presence inland may be amply accounted for owing to their sticky fruits having become attached to birds or animals that have come in contact with them.†

\* Residents in India are familiar with the treatment of "country-almonds" by the large "flying-foxes;" fruits carried off by them, and with a portion bitten out of the fleshy side, may be constantly found dropped at considerable distances from the trees on which the almonds grew. In Barren Island there is no doubt that the frugivorous bats which exist there are partly responsible for the same thing, and the writer had an opportunity of witnessing the rats, which abound on that island, engaged in the same act, these creatures having come down to the shore for the fruits that are common there and when disturbed scampering off up gullies with fruits in their mouths.

† A striking instance of the possibility of their becoming attached to the bodies of passing animals was witnessed by the writer on a path between Rangachang and Ali Musjid in South Andaman in April, 1891. Though some miles from the sea a considerable number of *Pisonia excelsa* trees occurred at the place, and the path was strewn with their fruits. A tree-snake was seen which had become entangled in a fallen panicle of these so that all escape was impossible, its every movement in-

And in addition to these instances it may be remarked that the whole group of species which may possibly have been introduced in the crops of grain-eating birds can be only considered as indirectly bird-introduced, since some accident must have happened to account for the death of the introducing bird in order to explain the germination of the seed and final introduction of the plant.

The "migrant" species, meaning thereby all that have certainly been introduced and all for which introduction is conceivable, may be divided into "civilized" species introduced by man, and "sylvestrian" or wild species. The wild species may be divided into "coast" species, further subdivided into "marine" and "littoral" species, the whole of the coast species being sea-introduced; and into "inland" species. These latter, which may of course also occur on the shore, but for the introduction of which the sea has not been responsible, may best be classed as "wind-introduced" and as "bird-introduced" species. Species introduced by birds may have been introduced either attached to the bodies of these or carried in their crops. These different groups will be discussed in detail; last of all the "remanent" species will be considered.

The "civilized" species comprise cultivated plants and weeds of cultivation or of waste places; the former corresponding practically to domestic animals like the cow or horse, and to domestic insects like the bee or silk-worm, the latter to the vermin that associate themselves with, or accompany man and his domestic creatures. This group therefore contains the species that may, directly as economic or æsthetic plants, or indirectly as weeds, have been introduced by man. The list subjoined includes the whole of the species present in the islands that are known to be sometimes thus introduced; those that are likely to be here indigenous, or to have been introduced by other than human agency, are enclosed within brackets and will be found again in one or, at times, more than one of the subsequent lists.

*List of Civilized species found in the Coco Group.*

\* *Nymphaea rubra.*

This variety has perhaps been introduced intentionally into Great Coco, where it occurs in the small lake. It has to be recollected that it is a favourite flower with the Burmese and is sold for votive purposes in the Pagodas

volving it more hopelessly in the tangled sticky mass. After the snake died its body was carefully examined and it was found that it had suffered no previous physical injury which could account for its inability to escape.

about Rangoon; also that the settlement was attempted by a Rangoon gentleman whose servants were, at least partly, Burmese. But typical white *Nymphaea Lotus* occurs in Little Coco, clearly independently of human agency.

*Sida carpinifolia.*

[*Urena lobata.*

Table Island (the older clearing) only.

As a rule this species would, without hesitation, be dealt with as a weed; in Great Coco, however, it does not occur in the clearing and it was not found on Table Island at all. If introduced here, we may safely say that human agency is not responsible for its appearance; more probably it has been introduced by the agency of birds].

\* *Hibiscus Sabdariffa*

Great Coco; in the old garden and evidently struggling against extinction.

5. \* *Hibiscus Abolmoschus.*

Table Island only; but common in many parts of the clearing.

\* *Moringa pterygosperma.*

Great Coco; a few trees evidently planted; these are very healthy, and seedlings are already springing up under the adjacent Coco-nut trees.

\* *Crotalaria sericea.*

Table Island only; but very abundant; the species may have been unintentionally introduced, but more probably has been brought by the servants at the light-house, who are Burmans and with whom the flower is a favourite.

\* *Desmodium triflorum.*

Table Island only; common however on all the grassy slopes.

\* *Alysicarpus vaginalis.*

Great Coco; not seen on Table Island, though it probably occurs there.

10. \* *Phaseolus* sp.

Seedlings in cow-dung on one grassy slope at south-west corner of island. These were seen in 1890; no species was seen in 1889 likely to have given origin to these and there is no indigenous species to which it seems likely they could belong. Unfortunately

- neither clearing could be revisited in 1890 to enable the writer to make further investigation.
- \* *Tamarindus indica*. Great Coco; only one tree and that, though almost certainly introduced by man probably unintentionally so.
- \* *Carica Papaya*. Great Coco; perfectly naturalised and very profuse in the Coco-nut zone, especially in the north end of the island.
- [*Vernonia cinerea*. Both islands; extremely abundant in the clearings, but also plentiful on grassy slopes and bare rocky headlands of the western coast of Great Coco; it also occurs on Rutland Island, at the opposite extremity of the Andaman group, where introduction by man is hardly conceivable: here probably it owes its presence to the agency of wind.]
- [*Adenostemma viscosum*. Great Coco; common on bare rocky promontories on west side and at north end of island. If introduced here it has been introduced independently of human agency; it is probably a sea-introduced species, but perhaps its fruits *may* have come attached to the feathers of birds.]
15. \* *Ageratum conyzoides*. Table Island; common in the clearing; not present in Great Coco.
- Ipomæa coccinea*. Table Island; a garden escape, but very plentiful on the edges of jungle-paths far from the lighthouse garden.
- •  
*Ipomæa Batatas*. • Table Island; cultivated only: has not survived on Great Coco, probably owing to the presence of wild pigs. These the writer did not see on Great Coco but their traces were abundant on Table Island and the pigs themselves were obtained on Little Coco. Moreover, Mr. Hume (*Stray Feathers*, ii, p. 111) actually met with them on Great Coco. During our visits 5 or 6 abandoned pariah dogs were seen

- on the island ; but, though these must necessarily have rendered the pigs shy, it can hardly be supposed that they have exterminated them. . .
- \* *Solanum Melongera*. Table Island ; cultivated. Great Coco ; in the old garden and also plentiful all over the clearing ; apparently quite naturalised.
- Capsicum minimum*. Table Island ; cultivated, and as an escape. Great Coco ; very plentiful and spreading far into the jungle.
20. \* *Scoparia dulcis*. Both islands ; common in the clearings.
- \* *Rungia pectinata*. Table Island ; only in the clearing ; not plentiful and as it is not met with in Great Coco is probably here, as it often is, an introduced weed. But it need not always be so since the species is abundant on bare rocky promontories at the south end of Rutland Island where introduction by human agency is not to be thought of.
- [*Anisomeles ovata*. Great Coco ; this species is not present on Table Island apparently, and on Great Coco it was only found on the isthmus connecting the north-eastern peninsula—where the clearing is—with the main island. But the species does not occur in the clearing, and it is remarkably abundant where it occurs. Moreover it is exceedingly abundant in Diamond Island, off the Arracan Coast, which is another section of the same island chain ; the writer is therefore inclined to believe that the species does not owe its introduction to human agency but that it may be classed among the remanent species.]
- [*Boerhaavia repens*. In all three islands, common on rocky promontories and bare isolated rocks though a frequent weed of cultivation this owes its presence here, not to human influence, but to the agency of

- the sea or to that of littoral birds, such as the Bitterns and Terns that frequent the reefs and rocks, its sticky fruits probably attaching themselves to the feet of these.]
- \* *Celosia cristata*. Table Island, a common escape.
25. \* *Achyranthes aspera*. Both islands, common in the clearings and undoubtedly introduced by man. But on Little Coco, the very distinct var. *porphyristachya* is abundant as a climber in the *Pandanus* sea-fence and is probably, like the same variety in the Nicobars, Laccadives, etc., a plant introduced by the sea.
- \* *Gomphrena globosa*. Table Island, an abundant escape.
- \* *Euphorbia pilulifera*. Table Island, a weed in the clearing, still rare.
- \* *Musa sapientum*. There is a Plantain-garden attached to the lighthouse on Table Island. No Plantains are left on Great Coco, doubtless owing to the cattle. These animals eat not only coco-nut leaves but also the leaves of *Pandanus odoratissimus*, so that one is surprised to find that they have left anything in the garden at all. Except for the cattle (and perhaps the pigs, which might grout up the stocks) there is no reason why the Plantain should not thrive if left to itself. In Narcondam there is a grove of Plantains, introduced (by Col. Tytler?), in excellent health.
- \* *Cocos nucifera*. Common in all three islands but deserving neither to be deemed indigenous nor to be considered a species introduced by the sea. The question whether its presence is due to some old attempt at settlement or to the shipwreck of some coco-nut laden craft is discussed more fully below.
30. \* *Kyllinga brevifolia*. Both islands, only in the clearings.
- \* *Fimbristylis diphylla*. Both islands, only in the clearings.

- \* *Panicum ciliare*. Great Coco; near south end of island beside some shelter huts used by coco-nut collectors.
- Panicum colonum*. Both islands, in the clearings and also at south end of Great Coco near the shelter huts.
- \* *Panicum Helopus*. Table Island, in the clearing.
35. \* *Eleusine indica*. Table Island, clearing, common; Great Coco, rare in the clearing, also a few tufts among droppings of cattle on a bare hill at south-west corner of the island.
- \* *Eleusine ægyptiaca*. Table Island; lighthouse clearing, still rare. [All the *Cyperaceæ* and *Gramineæ* may have been introduced by birds.]

Of the above, nineteen are species which are, or may be, cultivated for economic or æsthetic reasons—the economic plants being *Hibiscus Sabdariffa* (the Rozelle), *Hibiscus Abelmoschus* (the Musk-mallow), *Moringa pterygosperma* (the Horse-Radish tree), *Phaseolus* sp., *Tamarindus indica* (the Tamarind), *Carica Papaya* (the Papaw), *Ipomœa Batatas* (the Sweet-Potato), *Solanum Melongena* (the Brinjal), *Capsicum minimum* (the Bird's-Eye Chillee), *Musa sapientum* (the Plantain), *Cocos nucifera* (the Coco-nut), *Panicum ciliare*, *colonum* and *Helopus* (three wild fodder-millet). Ten of these have undoubtedly been intentionally introduced—one (the Tamarind) certainly has not, and the three fodder grasses may have come as weeds, or equally probably, may have been introduced by grain-eating birds. The æsthetic plants are *Nymphœa rubra*, *Crotalaria sericea*, *Ipomœa coccinea*, *Celosia cristata*, and *Gomphrena globosa*. *Crotalaria sericea* may have been involuntarily introduced, the others almost certainly have been brought intentionally. The other seventeen are, or may be, weeds, but there is every probability that five of them, *Urena lobata*, *Vernonia cinerea*, *Adenostemma viscosum*, *Anisomeles ovata*, and *Boerhaavia repens* do not owe their presence here to human agency.

Of the introduced economic species three are evidently unfitted to survive under the conditions to which, when abandoned, they are exposed. The Rozelle succumbs to climatic influences, the Sweet-Potato and the Plantain are destroyed by animals. On the other hand the propagation of two of these species—the Papaya and the Bird's-Eye Chillee—is remarkable both for its extent and rapidity, and for the fact that the flavour and pungency of the fruit of these species remains undiminished.

The Coco-nut tree deserves to be specially noticed. It is not known where *Cocos nucifera* is "indigenous" and the suggestion that it is "really wild" on the Coco Islands and along the north-western coast of North Andaman, made by the late Mr. Kurz, (*Forest Flora of British Burma* ii, 540), though true enough so far as the Coco Islands are concerned, is denied, as regards North Andaman, by those officers at Port Blair who have had opportunities of investigating the shores of the group. Mr. Kurz did not himself visit either the Coco group or North Andaman, and unfortunately he does not give any authority for the latter part of his statement. But, granting its correctness, the fact remains that about Port Blair the tree only occurs as a recent introduction and it is not met with elsewhere either in South or Middle Andaman, except as a few young trees that have, on Rutland Island, the Sentinels, etc., been deliberately planted. More recently the writer has been told of a bay in one of the islands of the "Archipelago," near Port Blair, which is lined with Coco-nut trees, the result of the wreck of a particular craft that was lost on her way from the Nicobars to a Burmese port; this statement the writer has not yet been able personally to verify. In Narcondam there are Coco-nut trees in no fewer than three places, and as there is absolutely nothing to disturb them there, they are spreading rapidly. In Barren Island also there is one bay where a considerable number of Coco-nut trees grow and where also the species is rapidly spreading. But in both these islands the introduction has been deliberate and quite recent; this in Narcondam is particularly evident from the fact that the oldest trees occur along with a grove of Plantains, though it is equally apparent that the spread of the species to one, and probably to both, of the two other bays where it occurs, has been unassisted by man and is due to fallen nuts having been drifted round from the first planted trees. It is, however, very remarkable that *Cocos nucifera* should be so abundant in the Coco group and be absent from, or very rare in, the Andamans proper, including Little Andaman, and that the species should again occur in such abundance in the Nicobars. The direction of the ocean currents has been suggested as possibly explaining the fact, but with very unsatisfactory results, because, whatever be the theoretical direction assumed for these currents in order to explain the distribution of *Cocos nucifera*, it must fail to coincide with the direction postulated to explain the distribution of *Casuarina equisetifolia*, a tree which is extremely common in the Nicobars and is so plentiful in Little Andaman, where there are no Coco-nuts, that the English equivalent for the Andamanese name of the island is "Casuarina-sand," the name taking its origin from the great prevalence of this species on all its beaches. But though there are no Coco-nut trees in the Andaman group



proper, there is one place where *Casuarina equisetifolia* occurs. This is a small bay, Casuarina Bay, on the west coast of North Andaman, on the beach of which the species is plentiful.\* In the Coco group, where there are Coco-nut trees, there is no *Casuarina equisetifolia* though it occurs again in Arracan and Chittagong where there are no Coco-nuts. As a matter of fact there is a steady current northward along the west coast of the Andamans for a considerable period of the year and it is difficult to understand why both *Cocos* and *Casuarina* do not occur plentifully along the whole west coast of the Andaman chain. The writer's examination of the ocean-drifts of the Coco group during his two visits did not throw much light on the subject. Wreckage in considerable quantity is to be found along the whole of the coasts, in most cases, however, belonging to wrecks that have occurred on the spot; the disposition of the fragments therefore only throws light on the "set" of local currents. Among the exceptions to this were a dressed teak-log on the east side of Great Coco, a padouk-log on the east side of Jerry Island, a quantity of Burmese sea-fishing-gear on the eyot between Great Coco and Jerry, fragments of two different Andamanese canoes on the east coast of Great Coco, a clump with roots of a very large Bamboo (not improbably *Bambusa gigantea*) on the west side of Great Coco, part of a third Andamanese canoe on the east side of the Little Coco, and a fruit, with part of stalk, of *Nipa fruticans* at the south end of Little Coco. Except the Andamanese canoes the whole of these objects indicated a "set" of ocean-current from Burma, for though *Nipa fruticans* which, strangely, appears to be absent from the Cocos, is both a Burmese and an Andamans species, this particular fruit had its stalk cut cleanly off by some sharp implement, and if it came from the Andamans it must therefore have floated from the neighbourhood of the settlement at Port Blair, a sufficiently improbable circumstance, as the examination of a map of the Andaman sea will show. Now if the set of the currents is such as to bring "drift" from Burma, and if these currents have brought the Coco-nut tree originally to the islands, we must explain how it happens that the islands of the "Archipelago" near port Blair, on the shores of which an undoubtedly Burmese "drift", in the shape of teak-logs, etc., is very plentiful, do not have Coco-nut trees on all their coasts. It has been suggested that the ocean-currents have thrown up Coco-nuts on the shores of the Andamans as well as on those of the Cocos, but that owing to the presence of the aboriginal inhabitants, always on the outlook for what they may pick up on the shore, the establishment of the species in the larger group has been impossible because any nut thrown up is found by them and immediately eaten or destroyed. This suggestion the writer owes to Mr. M. V. Portman of

Port Blair; it remains nevertheless difficult to understand why not a single Coco-nut should have escaped the notice of the Andamanese—who after all are not a numerous race—while, as it happens, we have Mr. Kurz's positive statement that in certain parts of North Andaman the species does occur.

It seems to the writer that for this particular group of islands, although the spread of the Coco-nuts *within* the group is undoubtedly due to the agency of the sea, the ocean-current theory does not explain the presence of the species, and that the original introduction has more probably been due to human interference. The question remains whether this was voluntary or involuntary. It may have been the result of an attempt at settlement in the island. The most recent attempt, which dates from 1878, is not the only one on record. An earlier attempt, as unsuccessful as the last, was made in 1840. But it does not follow, though these are the only attempts known, that they are the only ones which have been made. Both were made entirely on account of the Coco-nut being present in the islands, as perhaps other attempts before them may have been, for it appears that the name Coco Islands, implying the establishment there of *Coco nucifera* and the knowledge of that fact by navigators, dates from some of the very earliest European visits to Eastern seas. But it is not impossible that a yet earlier attempt to settle here may have been made and that the introduction of the Coco-nut may have been one of its results. It is easy to understand that these islands should have been chosen in preference to the more inviting-looking Andaman group owing to the character for ferocity which, for some curious reason, was attributed to the inhabitants of the Andamans by early navigators, and it is as easy to understand that the adverse natural conditions which prevail, and which have caused the failure of all recent attempts at settlement, must soon have led to the abandonment of the earliest attempt. The writer feels inclined to think that this may be the true explanation of the presence of *Coco nucifera* in the Cocos Islands. But it may quite as readily have been due to involuntary introduction by ship-wreck; for while disinclined to accept the suggestion that there are no Coco-nut trees in the Andamans because the Andamanese have eaten all the stranded Coco-nuts, when it is applied to nuts thrown up by ocean-currents, the writer thinks this explanation may well enough account for the presence of Coco-nut trees in the Cocos while they are absent from the main islands, if introduction by reason of ship-wreck is postulated. In the Cocos there are no inhabitants, while in the main islands there are; and though it is scarcely reasonable to suppose that the Andamanese would detect every nut that is cast up on the beach, there is little doubt that they would soon become aware of the

wreck of a Coco-nut craft and, becoming aware of it, there is as little doubt that they would soon consume every Coco-nut the vessel contained.

Now that the Coco-nut tree is established in the islands, it germinates profusely. Even towards the centre of the island on flat or muddy tracts one meets with groves, containing from a score to several hundreds of trees, that have originated from nuts which have been floated inland by unusually high tides and left stranded far from the coast. The stems of these inland examples are abnormally tall, shooting up till the leafy head rises above the surrounding jungle; as far as can be seen, they do not flower till this happens. Once they have flowered and fruited the fallen nuts multiply the species fifty-fold. The nut appears to have but few enemies, and though a good many may be seen with a hole drilled through the husk and with the kernel scooped out, (apparently both crabs and rats are able to effect this,) the number thus destroyed forms quite an inappreciable proportion of the whole. The tree does not, however, invade the ridges, the soil is doubtless, as it is in South Andaman, too poor to suit it; while in trees growing along the bays on the west side of Great Coco the contents of the nut are distinctly less and their quality is appreciably poorer than in trees at the head of the bays on the opposite side; these in turn produce nuts that do not bear comparison with the magnificent examples grown in the Nicobars.

In the subjoined table the distribution of the "civilized" species is given; in those cases where the species is believed to be truly indigenous in a particular area the distribution mark indicating the area in question is enclosed within ( ) brackets. From this table we learn that 28 of these species, or 80 per cent. of the whole, are cosmopolitan in the tropics, and that, with the exception of one weed and two cultivated species, which do not occur in the Orient, they are sub-tropical as well as tropical species. The original home of about one-half of the species is known with some degree of certainty and it is interesting to note that 7, or 20 per cent. of the class, are originally natives of the New World, introduced in consequence of human intercourse into, and now established in, the Eastern Hemisphere as well. Ten of them are known to be natives of South-Eastern Asia; only six of these have spread beyond that area.

TABLE XII. *Distribution of "Civilized" species present in the Cocco Group.*

| Cultivated species. | Weeds. | SPECIES.                         | Africa. | Orient. | S. E. Asia. | Australia. | Polynesia. | America. |
|---------------------|--------|----------------------------------|---------|---------|-------------|------------|------------|----------|
| 1                   | —      | <i>Nymphaea rubra</i> ...        | x       | x       | x           | —          | —          | —        |
| —                   | 1      | <i>Sida carpinifolia</i> ...     | x       | x       | x           | x          | x          | x        |
| —                   | 1      | [ <i>Urena lobata</i> ] ...      | x       | —       | x           | x          | x          | x        |
| 1                   | —      | <i>Hibiscus Sabdariffa</i> ...   | x       | x       | (x)         | x          | x          | x        |
| 1                   | —      | <i>Hibiscus Abelmoschus</i> ...  | x       | x       | (x)         | x          | x          | x        |
| 1                   | —      | <i>Moringa pterygosperma</i> ... | x       | x       | (x)         | x          | x          | x        |
| 1                   | —      | <i>Crotalaria sericea</i> ...    | —       | —       | (x)         | —          | —          | —        |
| —                   | 1      | <i>Desmodium triflorum</i> ...   | x       | x       | x           | x          | x          | x        |
| —                   | 1      | <i>Alysicarpus vaginalis</i> ... | x       | x       | (x)         | x          | x          | x        |
| 1                   | —      | <i>Phaseolus</i> sp. ...         | p       | p       | x           | p          | p          | p        |
| 1                   | —      | <i>Tamarindus indica</i> ...     | (x)     | x       | x           | x          | x          | x        |
| 1                   | —      | <i>Carica Papaya</i> ...         | x       | x       | x           | x          | x          | (x)      |
| —                   | 1      | <i>Vernonia cinerea</i> ...      | x       | x       | x           | x          | x          | x        |
| —                   | 1      | <i>Adenostemma viscosum</i> ...  | x       | x       | x           | x          | x          | x        |
| —                   | 1      | <i>Ageratum conyzoides</i> ...   | x       | x       | x           | x          | x          | (x)      |
| 1                   | —      | <i>Ipomoea coccinea</i> ...      | x       | x       | x           | x          | x          | (x)      |
| 1                   | —      | <i>Ipomoea Batatas</i> ...       | x       | x       | x           | x          | x          | (x)      |
| 1                   | —      | <i>Solanum Melongena</i> ...     | x       | x       | (x)         | x          | x          | x        |
| 1                   | —      | <i>Capsicum minimum</i> ...      | —       | —       | (x)         | —          | —          | —        |
| —                   | 1      | <i>Scoparia dulcis</i> ...       | x       | x       | x           | x          | x          | (x)      |
| —                   | 1      | <i>Rungia pectinata</i> ...      | —       | —       | (x)         | —          | —          | —        |
| —                   | 1      | [ <i>Anisomeles ovata</i> ] ...  | —       | —       | (x)         | —          | —          | —        |
| —                   | 1      | [ <i>Boerhaavia repens</i> ] ... | x       | x       | x           | x          | x          | —        |
| 1                   | —      | <i>Celosia cristata</i> ...      | x       | x       | x           | —          | —          | x        |
| —                   | 1      | <i>Achyranthes aspera</i> ...    | x       | x       | x           | x          | x          | x        |
| 1                   | —      | <i>Gomphrena globosa</i> ...     | x       | x       | x           | x          | x          | (x)      |
| —                   | 1      | <i>Euphorbia pilulifera</i> ...  | x       | x       | x           | x          | x          | x        |
| 1                   | —      | <i>Musa sapientum</i> ...        | x       | —       | (x)         | x          | x          | x        |
| 1                   | —      | <i>Cocos nucifera</i> ...        | x       | —       | x           | x          | x          | (x)      |
| —                   | 1      | <i>Kyllinga brevifolia</i> ...   | x       | x       | x           | x          | x          | x        |
| —                   | 1      | <i>Fimbristylis diphylla</i> ... | x       | x       | x           | x          | x          | x        |
| 1                   | —      | [ <i>Panicum colonum</i> ] ...   | x       | x       | x           | x          | x          | x        |
| —                   | 1      | <i>Panicum ciliare</i> ...       | x       | x       | x           | x          | x          | x        |
| 1                   | —      | [ <i>Panicum Helopus</i> ] ...   | x       | x       | x           | —          | —          | —        |
| —                   | 1      | <i>Eleusine indica</i> ...       | x       | x       | x           | x          | x          | x        |
| —                   | 1      | <i>Eleusine ægyptiaca</i> ...    | x       | x       | x           | x          | x          | x        |

The only *Cryptogam* that belongs to this class is the incompletely known *Fungus* the mycelium of which has proved so destructive to the tea-crop at Port Blair. From what has been said in the account of this species it will be seen that the species, whatever it may be, is certainly indigenous in, or at any rate has not been introduced by human agency into, the Andaman group.

We have now to consider the "sylvestrian", or truly wild, "migrant" species. These may be conveniently subdivided into "coast" and "inland" species—the former a group the members of which may and here in most instances probably do, owe their presence

to introduction by means of ocean-currents. But just as we have seen that some of the weeds may be claimed as indigenous, or at all events as introduced by other than human agency, so here we find that these classes pass insensibly into each other and that species which may be introduced by the sea, such as *Entada scandens*, *Gloriosa superba*, *Boerhaavia repens*, *Cocos nucifera*, etc., may quite as reasonably owe their presence to a previous land-connection, to wind, to birds, or to involuntary or voluntary human agency. The more doubtful instances, however, will be found discussed in detail below. This group of species, however, as a whole, is characterised by a general distribution which is directly affected by the physiographical features of, and the currents that prevail in, the surrounding seas, and is only indirectly, if at all, influenced by the configuration of the adjacent land.

The "coast" species have to be further subdivided in "marine" and "littoral" species, and the former group, as comprising the plants for which the influence of ocean-currents is most evident, will be considered first. Only one *Phanerogam* belongs to this class; this species, *Cymodocea ciliata*, is however almost the most plentiful, the only other common species being *Sargassum ilicifolium*; all the others are very inconspicuous, being few in number, small in size, and scantily represented.

The following table gives at once a list of, and indicates the marine distribution for, these species; for six of them, as the general list shews, this is, as regards the *Algae*, only approximate.

TABLE XIII. *Distribution of the "Marine" species present in the Coco Group.*

| SPECIES.                         |           |               |          | SPECIES.                          |           |               |          |
|----------------------------------|-----------|---------------|----------|-----------------------------------|-----------|---------------|----------|
|                                  | Atlantic. | Indian Ocean. | Pacific. |                                   | Atlantic. | Indian Ocean. | Pacific. |
| <i>Cymodocea ciliata</i>         | —         | x             | x        | <i>Gelidium corneum</i>           | x         | x             | x        |
| <i>Sargassum ilicifolium</i>     | x         | x             | x        | <i>Caulerpa clavifera</i>         | —         | x             | x        |
| <i>Turbinaria ornata</i>         | —         | x             | —        | <i>Caulerpa plumaris</i>          | —         | x             | —        |
| <i>Padina pavonia</i>            | x         | x             | x        | <i>Valonia fastigiata</i>         | —         | x             | x        |
| <i>Dictyota dichotoma</i>        | x         | x             | x        | <i>Valonia confervoides</i>       | —         | x             | —        |
| <i>Lithothamnion polymorphum</i> | x         | x             | —        | <i>Halimeda Opuntia</i>           | x         | x             | x        |
| <i>Acanthophora Thierii</i>      | x         | x             | x        | <i>Siphonocladus ? filiformis</i> | —         | x             | —        |
| <i>Jania tenella</i>             | —         | x             | —        | <i>Vaucheria sp.</i>              | —         | x             | —        |
| <i>Gracilaria crassa</i>         | —         | x             | —        | <i>Calothrix pulvinata</i>        | x         | x             | x        |

Nearly one-half of the species are cosmopolitan in tropical seas; probably some of the six of which the distribution is not accurately ascertained are also cosmopolitan. One species appears to extend

only to the Pacific from the Indian Ocean, another only to the Atlantic from the Indian Ocean. The *Cymodocea*, though present in Africa, appears not to be recorded from the Mascarene Islands, and *Sargassum ilicifolium* though occurring in Malayan waters, has not yet been found on the coasts of Northern Australia. One species, *Dictyota dichotoma*, is rather more frequent in sub-tropical than in tropical seas and is cosmopolitan in both the northern and the southern hemispheres.

The next group of species to be considered—the “littoral”—includes many plants for which the evidence of introduction by the sea is almost as palpable as in the case of the “marine” species themselves. They germinate on the beaches, and grow only near the sea, preferably in muddy creeks or on the sand or shingle; their fruits and seeds are found in every “drift” and the species themselves occur on every Indian or Malayan coast. Such are the true mangroves and the species like *Avicennia*, *Agiceras*, *Carapa*, that are constantly associated with the mangrove-vegetation; the sand-binding species like *Ipomoea biloba*, *Euphorbia Aloto*, *Sesuvium Portulacastrum*, *Vigna lutea*, *Thaurea sarmentosa*; the tropical sea-fence of *Palldanus odoratissimus*, *Desmodium umbellatum*, *Sophora tomentosa*, *Tournefortia argentea*, *Clerodendron inerme*, *Vitex Negundo*, with its concomitant climbing vegetation, *Cavendishia obtusifolia*, *Ipomoea digitata*, *Argyrea ilicifolia*; the outer beach-forest of *Terminalia Catappa*, *Hernandia peltata*, *Brythrina indica*, *Stephegyne diversifolia*; the inner beach forest of *Cycas*, *Mimusops* and *Pisonia*; and even the species of the mud-flats within, like *Lcea sambucina*, *Hibiscus tiliaceus*, *Cynometra ramiflora*, *Flagellaria indica* and many more. The seeds of all these have been observed by the writer in the “drifts” of these islands and many of them have been noted, either in the Andamans and Nicobars, or in Narcondam, germinating on the beach. There are others, however, that are more doubtful, and, though the whole of the species for which this mode of introduction is conceivable are given below, the species for which any doubt is possible are enclosed in brackets and the more equivocal of these are discussed at the end of the list.\*

\* Since this paper was written and while these pages have been passing through the press two papers have appeared that deal with this section of the flora of the Malayan countries much more fully than the scope of the present paper permits. To these papers, viz:—*Schimper: Die Indo-Malayische Strandflora* (Jena: Gustav Fischer. 1891) and *Karsten: Ueber die Mangrove-Vegetation in Malayischen Archipel; Bibliotheca Botanica*, Heft 22 (Cassel: Theodor Fischer, 1891) neither of which had appeared when the writer's remarks were written and which he greatly regrets having been unable to refer to in the text, the writer would refer those who are interested in the subject of mangrove and coast plants and the influence of ocean-currents and their distribution.



| SPECIES. |                                    | Atlantio.        |                 | Indian Ocean.   |                    |                | Malay seas.                    | Pacifio.       |                     |            |                  |
|----------|------------------------------------|------------------|-----------------|-----------------|--------------------|----------------|--------------------------------|----------------|---------------------|------------|------------------|
|          |                                    | Eastern America. | Western Africa. | Eastern Africa. | Mascarene Islands. | Indian coasts. | Burma, Malacca, Andaman, Java. | Malay Islands. | Northern Australia. | Polynesia. | Western America. |
|          | [ <i>Ardisia humilis</i> ]         | ...              | ...             | ...             | ...                | ...            | ...                            | ...            | ...                 | ...        | ...              |
|          | <i>Aegiceras majus</i>             | ...              | ...             | ...             | ...                | ...            | ...                            | ...            | ...                 | ...        | ...              |
|          | <i>Mimusops littoralis</i>         | ...              | ...             | ...             | ...                | ...            | ...                            | ...            | ...                 | ...        | ...              |
| 50.      | <i>Cerbera Odollam</i>             | ...              | ...             | ...             | ...                | ...            | ...                            | ...            | ...                 | ...        | ...              |
|          | <i>Ochrosia borbonica</i>          | ...              | ...             | ...             | ...                | ...            | ...                            | ...            | ...                 | ...        | ...              |
|          | <i>Tabernaemontana crispa</i>      | ...              | ...             | ...             | ...                | ...            | ...                            | ...            | ...                 | ...        | ...              |
|          | <i>Sarcobolus globosus</i>         | ...              | ...             | ...             | ...                | ...            | ...                            | ...            | ...                 | ...        | ...              |
|          | <i>Cordia subcordata</i>           | ...              | ...             | ...             | ...                | ...            | ...                            | ...            | ...                 | ...        | ...              |
| 55.      | <i>Tournefortia argentea</i>       | ...              | ...             | ...             | ...                | ...            | ...                            | ...            | ...                 | ...        | ...              |
|          | <i>Argyreia tiliaefolia</i>        | ...              | ...             | ...             | ...                | ...            | ...                            | ...            | ...                 | ...        | ...              |
|          | <i>Ipomæa grandiflora</i>          | ...              | ...             | ...             | ...                | ...            | ...                            | ...            | ...                 | ...        | ...              |
|          | <i>Ipomæa digitata</i>             | ...              | ...             | ...             | ...                | ...            | ...                            | ...            | ...                 | ...        | ...              |
|          | <i>Ipomæa denticulata</i>          | ...              | ...             | ...             | ...                | ...            | ...                            | ...            | ...                 | ...        | ...              |
| 60.      | <i>Ipomæa biloba</i>               | ...              | ...             | ...             | ...                | ...            | ...                            | ...            | ...                 | ...        | ...              |
|          | <i>Convolvulus parviflorus</i>     | ...              | ...             | ...             | ...                | ...            | ...                            | ...            | ...                 | ...        | ...              |
|          | <i>Physalis minima</i>             | ...              | ...             | ...             | ...                | ...            | ...                            | ...            | ...                 | ...        | ...              |
|          | [ <i>Oroxylum indicum</i> ]        | ...              | ...             | ...             | ...                | ...            | ...                            | ...            | ...                 | ...        | ...              |
|          | <i>Eranthemum succifolium</i>      | ...              | ...             | ...             | ...                | ...            | ...                            | ...            | ...                 | ...        | ...              |
| 65.      | [ <i>Peristrophe acuminata</i> ]   | ...              | ...             | ...             | ...                | ...            | ...                            | ...            | ...                 | ...        | ...              |
|          | [ <i>Lippia nodiflora</i> ]        | ...              | ...             | ...             | ...                | ...            | ...                            | ...            | ...                 | ...        | ...              |
|          | <i>Premna integrifolia</i>         | ...              | ...             | ...             | ...                | ...            | ...                            | ...            | ...                 | ...        | ...              |
|          | <i>Premna</i> sp.                  | ...              | ...             | ...             | ...                | ...            | ...                            | ...            | ...                 | ...        | ...              |
|          | <i>Vitex Negundo</i>               | ...              | ...             | ...             | ...                | ...            | ...                            | ...            | ...                 | ...        | ...              |
| 70.      | [ <i>Vitex pubescens</i> ]         | ...              | ...             | ...             | ...                | ...            | ...                            | ...            | ...                 | ...        | ...              |
|          | [ <i>Vitex Wimberleyi</i> ]        | ...              | ...             | ...             | ...                | ...            | ...                            | ...            | ...                 | ...        | ...              |
|          | <i>Olerodendron inerme</i>         | ...              | ...             | ...             | ...                | ...            | ...                            | ...            | ...                 | ...        | ...              |
|          | <i>Avicennia officinalis</i>       | ...              | ...             | ...             | ...                | ...            | ...                            | ...            | ...                 | ...        | ...              |
|          | <i>Boerhaavia repens</i>           | ...              | ...             | ...             | ...                | ...            | ...                            | ...            | ...                 | ...        | ...              |
| 75.      | <i>Pisonia aculeata</i>            | ...              | ...             | ...             | ...                | ...            | ...                            | ...            | ...                 | ...        | ...              |
|          | [ <i>Pisonia excelsa</i> ]         | ...              | ...             | ...             | ...                | ...            | ...                            | ...            | ...                 | ...        | ...              |
|          | <i>Achyranthes porphyriatachya</i> | ...              | ...             | ...             | ...                | ...            | ...                            | ...            | ...                 | ...        | ...              |
|          | <i>Hernandia peltata</i>           | ...              | ...             | ...             | ...                | ...            | ...                            | ...            | ...                 | ...        | ...              |
|          | <i>Cassytha filiformis</i>         | ...              | ...             | ...             | ...                | ...            | ...                            | ...            | ...                 | ...        | ...              |
| 80.      | <i>Euphorbia Atoto</i>             | ...              | ...             | ...             | ...                | ...            | ...                            | ...            | ...                 | ...        | ...              |
|          | <i>Macaranga Tanarius</i>          | ...              | ...             | ...             | ...                | ...            | ...                            | ...            | ...                 | ...        | ...              |
|          | <i>Cycas Ramphii</i>               | ...              | ...             | ...             | ...                | ...            | ...                            | ...            | ...                 | ...        | ...              |
|          | <i>Crinum asiaticum</i>            | ...              | ...             | ...             | ...                | ...            | ...                            | ...            | ...                 | ...        | ...              |
|          | <i>Tacca pinnatifida</i>           | ...              | ...             | ...             | ...                | ...            | ...                            | ...            | ...                 | ...        | ...              |
| 85.      | <i>Dracæna angustifolia</i>        | ...              | ...             | ...             | ...                | ...            | ...                            | ...            | ...                 | ...        | ...              |
|          | [ <i>Gloriosa superba</i> ]        | ...              | ...             | ...             | ...                | ...            | ...                            | ...            | ...                 | ...        | ...              |
|          | <i>Flagellaria indica</i>          | ...              | ...             | ...             | ...                | ...            | ...                            | ...            | ...                 | ...        | ...              |
|          | <i>Caryota sobolifera</i>          | ...              | ...             | ...             | ...                | ...            | ...                            | ...            | ...                 | ...        | ...              |
|          | [ <i>Cocos nucifera</i> ]          | ...              | ...             | ...             | ...                | ...            | ...                            | ...            | ...                 | ...        | ...              |
| 90.      | <i>Pandanus odoratissimus</i>      | ...              | ...             | ...             | ...                | ...            | ...                            | ...            | ...                 | ...        | ...              |
|          | <i>Cyperus pennatus</i>            | ...              | ...             | ...             | ...                | ...            | ...                            | ...            | ...                 | ...        | ...              |
|          | <i>Fimbristylis ferruginea</i>     | ...              | ...             | ...             | ...                | ...            | ...                            | ...            | ...                 | ...        | ...              |
|          | <i>Thuarea sarmentosa</i>          | ...              | ...             | ...             | ...                | ...            | ...                            | ...            | ...                 | ...        | ...              |
|          | <i>Ischaemum muticum</i>           | ...              | ...             | ...             | ...                | ...            | ...                            | ...            | ...                 | ...        | ...              |



This list includes 94 species for which sea-introduction is conceivable, and for the presence of most of the species it contains this mode of introduction is almost certainly responsible. The list might even be made more extensive than it is, for if *Sterculia rubiginosa*, which is a purely "littoral" species here as it is elsewhere throughout the Andaman and Nicobar groups—to which area the variety found in the Coco Islands is strictly confined,—be sea-introduced, there is no reason why some of the other species of *Sterculia* should not be added. As a matter of fact the writer has collected specimens of species of *Sterculia* in Narcondam and in Batti Malv, the first island a locality where certainly, the second one where probably, every species present has been somehow or other introduced. But no *Sterculia* seeds were recognised in the "drifts" and therefore the whole of the species have been left out except this purely 'littoral' one, while even it has been omitted from consideration in the analysis of the table which follows. Again, *Leea hirta* might well be sea-introduced if *Leea sambucina* is; their fruits are very similar and *Leea* fruits are common in the "drifts." All the fruits found, however, were precisely the same and seemed to be undoubtedly those of *Leea sambucina*, which is a very common species in the mud flats that skirt the mangrove-swamps, where it occurs as a considerable shrub or small tree with stilted roots that imitate the style and appearance of those of the mangroves. Both species, however, may have been introduced by fruit-eating birds; only one therefore, owing to its habitat, is taken as an example of this mode of introduction, the other being relegated to the list of species that are bird-introduced. Another species to which the same remarks apply is *Ardisia humilis*, which is a purely beach-forest species and, as such, is equally common here, on Narcondam, in the Andamans, and in the Nicobars; perhaps it is, on the whole, more likely to have been introduced owing to birds having eaten its purple-berried fruit. *Allophylus Cobbe*, which is almost certainly bird-introduced, may be quoted in support of this, for though it also occurs in the interior it is a common tree in the *Pandanus* fence and in the beach-forest. *Dracontomelum mangiferum* might be a sea-introduced species, for Mr. Hemsley records a *Dracontomelum*? fruit from the New Guinea "drift", with empty seed-cells however (*Challenger Reports; Botany*, vol. i, part 3, p. 290). And if *Dracontomelum* be included so might *Spondias* and *Canarium*, for though birds and bats eat the pulpy fruits of these species they cannot swallow the stone and, as in the case of *Terminalia Catappa*, can hardly do more than assist in dispersing them locally. *Desmodium triquetrum* and *Desmodium polycarpum* are both very common on the rocky parts of the coast just above the spray-line and their fruits therefore are extremely common in the "drifts." But it is not at all clear that they must therefore

be put down in the list of sea-introduced species; they are well-known as weeds of cultivation elsewhere, being diffused because of the readiness with which the indehiscent segments of their fruits attach themselves to the clothes of man and to the fur of his domestic animals. Here they are undoubtedly not weeds introduced by man, but it may well be that they have been introduced by birds, owing to fragments of their pods having attached themselves to their feathers. Another species to which the same remarks apply is *Adenostemma viscosum*, though this is more probably sea-introduced than the other; still another is *Boerhaavia repens*; perhaps all four are distributed at one time by the sea, at another by birds. *Lippia nodiflora* may also be a bird-introduced species; its seeds may have been brought in the pellets of mud that become attached to the feet, and to the feathers at the base of the bill of wading- and swimming-birds. *Achyranthes porphyrostachya* which, from its situation in these islands, cannot be a weed introduced by man, and which is a common sea-shore species in the Nicobars and in the Laccadives also, may perhaps be bird-introduced like the *Desmodium*. If, as is suggested, now one agency, now another is responsible for the dispersal of these species, it is easy to understand why those species should all be "littoral" in these islands and yet occur as inland species in other localities. *Mucuna gigantea* will be readily admitted as an unequivocal example of this mode of distribution, as will *Derris sinuata*, for both occur in the beach-forest more commonly than they do on the ridges; so too, will the other *Leguminosae* of the list except perhaps *Entola scandens*. And yet *Entola scandens* must be sometimes an introduced species, for it is one of the plants that occur on Narcondam, an island for which it seems impossible to postulate any previous land-connection; the writer moreover had the good fortune to find one of its enormous seeds germinating along with those of *Mucuna*, etc., on the sandy islet between Great Coco and Jerry.

*Physalis minima* is a species that at first suggests bird-introduction rather than sea-introduction, and its wide inland dispersal undoubtedly is largely owing to its fruits being eaten and to the subsequent voiding of its hard discoid seeds. But here it is only found close to the sea just above the spray-line and its fruits were found in the "drifts" here and there, the light bladder-like calyx amply accounting for their flotation; the pulp of the fruit probably protects the seeds, if such protection be necessary, from the action of the salt water. Among the *Convolvulaceae*, for which this means of dispersal is not at all uncommon, the only species now included that calls for remark is *Convolvulus parviflorus*. It is, however, one of the commonest of the sea-face creepers along the west coast of Great Coco, and is equally common on Narcondam, Barren

Island, Rutland Island and Batti Malv, and is included in the list without any feeling of doubt in the mind of the writer. On the other hand, indeed, it is with some diffidence that another species, *Ipomœa Turpethum*, is omitted. All three species of *Vitex* given are "littoral," but while there seems no doubt that *Vitex Negundo* is sea-introduced, it is on the whole more probable that the others are introductions by fruit-eating birds. *Macaranga Tanarius* is also a species that from its habitat the writer has no hesitation in considering a sea-introduced species; another that he would have wished to include is *Blachia andamanica* which occurs on the coast with *Desmodium umbellatum*, *Pluchea indica* and other unequivocally littoral species. Moreover there are several of these shrubby and arboreal *Euphorbiaceæ* on Narcondam; their presence there indicates that some mode of introduction for species of this order must be possible. In the absence, however, of direct experiment with their seeds the others have been left to swell, probably unduly, the list of "remanent" species. *Tacca pinnatifida*, which is an inland as well as a coast species, may be bird-introduced, for its seeds are embedded in a sweet pulp. But though a species of ant is very fond of this fruit and scoops out all the ripe pulp, leaving the seeds bare but uninjured in an otherwise empty bag, no bird, so far as the writer could see, appears to eat them. The two *Pisonias*, one a climber, the other a tree, are both "littoral" and so may well be sea-introduced, but as both have peculiar fruits with glutinous lines along their sides they may equally well be bird-introduced species. The sticky lines along the angles of the fruits of *Pisonia excelsa* in particular have all the tenacity of bird-lime. As this species occurs some way inland as well as along the coast there is little doubt that, even if sea-introduced, its further dispersal is assisted by ground-feeding birds or small mammals. The fruits of two species of *Dipterocarpus* were seen in the "drifts," but the writer has no hesitation, from what is known regarding the delicacy of the seeds in this order and the rapidity with which their power of germinating is lost, in excluding both from the list. From what has already been said regarding "civilized" species it will be seen that though *Cocos nucifera* is undoubtedly capable of being introduced by the sea, it is probably not to this agency that its presence in these islands is due. *Caryota sobolifera*, however, which is throughout the whole Andaman group a very common species, both on flat and on rising ground, and which is as common on Narcondam as in the Cocos, is probably a sea-introduced species.

*Peristrophe acuminata* is another species that affects only the localities in which *Desmodium polycarpum* and its companions are found and ought probably to be included among the littoral species; in the absence

of further evidence, however, it is treated as only doubtfully sea-introduced. Another doubtful species is *Dodonaea viscosa*, a cosmopolitan species. Still another, equally doubtful, is *Gloriosa superba* which is exceedingly common in the coast zone on both the Coco Islands, and which the writer has collected, in the coast zone also and only there, in South Andaman, in Rutland Island, in Batti Malv, in Car Nicobar, in Narcondam, and in Barren Island, and which Dr. Alcock has collected, near the sea, in the Laccadives. On the whole therefore we might feel justified in considering it a sea-introduced species. But it is very abundant also throughout the whole of India; it extends from the Nilghiris and Central India to Rajputana, the Panjab, and the Gangetic plain, as well as to the Himalaya from Kamaon to Bhutan, and is common in Bengal, Assam and Burma. It cannot very easily be bird-introduced and one must therefore incline to the opinion that the agency responsible here is that of winds, a view which is favoured by the nature of its seeds. But even then it is not easy to suppose that winds could carry these as far as some of the islands mentioned and still that its distribution should be limited to South-Eastern Asia. *Orozyllum indicum* might possibly be sea-introduced, but on the whole has more probably been brought by wind. It need not be indigenous for it occurs in abundance in Narcondam. Though its fruits occur in the "drifts" they are always split open and it is unlikely that the seeds could remain attached to the fruit-segments during their transit from any of the neighbouring coasts.

Few of the cryptogams can be considered "littoral" and the statements that have been made of the possibility of *Fungi*, etc., being brought to ocean-islands attached to logs of wood or trunks of trees are not as a rule made by those who have seen and carefully examined ocean-drifts. Even *Polyporus sanguinale*, which apparently has a predilection for dead or dying trunks of *Cocos nucifera*, being commoner there than in any other situation, was not found growing on any of the trunks that lie on the beaches exposed to the sun after having been soaked in salt water. The logs that are cast up on the beach and the roots that protrude from the sand at those points where denudation is going on, are scrubbed bare by the coral-sand and bleached white by the sun; they harbour no *Fungi* and seem preserved from decay by the treatment to which they have been subjected. There is, however, a striking exception in a "dry-rot" which attacks *Mimusops littoralis* trunks and some other timbers. In the case of the Bullet-wood it was seen both on Great and Little Coco; the same appearance was presented by the remains of a wooden vessel in Little Coco. The appearance and consistence of this "dry-rot" so closely resemble the results of charring that it was difficult to realize that the wood in question had not been subjected to

fire. The effects of actual charring were, however, observed in the hollow trunk of a large *Mimusops* near the shelter huts at the south end of Great Coco; closer comparison shows that the product of the *Fungus* has a facies of its own unlike that of true charcoal. This difference is difficult to express in words, but is very recognisable when the two things are placed side by side. The phenomenon was not noticed in the case of *Erythrina*, *Heritiera*, *Stephegyne*, or other dead trees on the beach.

Excluding from consideration all the doubtful species enclosed in brackets we find that there are 80 unequivocally sea-introduced plants, or more than one-fourth of the phanerogamic species and over 22 per cent. of the entire flora. On consulting the distribution it is seen how greatly the coast flora is one characteristic of the Indian Ocean and of Malayan Seas, particularly the latter, since 76 species, or 97 per cent., occur on the shores of the Malay Islands, whereas only 66, or 83 per cent., occur on the Indian coasts of the Sea of Bengal. Moreover one of these, *Sarcolobus globosus*, might almost be omitted, its only Indian locality being the Sunderbuns, at the head of the Bay of Bengal. Another, *Ipomœa denticulata*, though extending up the eastern side of the Bay to the coast of Arracan, is, on the western side, confined to Ceylon. This indication of a tendency to extension eastward is borne out by the features of the further distribution of these species, for 60 species, or 76 per cent., extend south-eastward to the shores of northern Australia, while only 47, or 59 per cent., extend south-west to the Mascarene Islands; and 51 species, or 64 per cent., occur in one or other of the Polynesian groups, while only 36, or 46 per cent., reach continental East Africa. But, while this is the case, it is interesting to note that 21 species, or 24 per cent., occur on the African Atlantic coast, and 15 species, or 19 per cent., cross the Atlantic to the Eastern coasts of America, whereas only 13 species, or 16 per cent., extend across the Pacific from Polynesia to the Western American coasts. These features of the littoral flora are given more compactly in the subjoined table.

TABLE XV. *Extension of "littoral" species present in the Coco Group.*

| Species<br>extending westward to |                                    |                 |            |                   | Species<br>present in the | Species<br>extending eastward to |                  |            |                               |
|----------------------------------|------------------------------------|-----------------|------------|-------------------|---------------------------|----------------------------------|------------------|------------|-------------------------------|
| America.<br>(Atlantic Coasts.)   | West Africa.<br>(Atlantic Coasts.) | Eastern Africa. | Mascarene. | India and Ceylon. | Coco Group.               | Malay Archipelago.               | North Australia. | Polynesia. | America.<br>(Pacific Coasts.) |
| 15                               | 21                                 | 36              | 47         | 66                | 80                        | 76                               | 60               | 51         | 13                            |
| 19%                              | 24%                                | 46%             | 59%        | 83%               | 100%                      | 97%                              | 76%              | 64%        | 16%                           |

An analysis of the table of distribution from the opposite point of view is given below; from it we learn that 11 species, or 14 per cent., are cosmopolitan on tropical sea-shores; that four more are nearly cosmopolitan, being present in both hemispheres; that only four, so far as is known, are limited to the coasts of these islands, the Andamans and the Nicobars; and that, excepting these four, every one of the species is found on the Malayan Coasts. So far then as the "littoral" species are concerned we must conclude that the flora of the Coco Group is decidedly Malayan.

TABLE XVI. *Analysis of distribution of "Littoral" species.*

|  |    |
|--|----|
| Present on both Pacific and Atlantic coasts:—                | 19 |
| Cosmopolitan on tropical sea-shores:—                        | 11 |
| Almost ditto, (present in both hemispheres):—                | 4  |
| Absent from Pacific American coasts only:—                   | 2  |
| Absent from Pacific Polynesian coasts only                   | 1  |
| Absent from Eastern African and Mascarene coasts only        | 1  |
| Absent from New World entirely:—                             | 4  |
| Present on Atlantic and Indian Ocean (not on Pacific) coasts | 1  |
| Present on Pacific and Indian Ocean (not on Atlantic) coasts | 15 |
| Extending from Africa to Polynesia:—                         | 14 |
| On all intervening shores:—                                  | 1  |
| Absent only from Northern Australia                          | 1  |
| Extending from Mascarene islands to Polynesia:—              |    |
| Extending from India to Polynesia                            | 1  |
| Extending from Coco Islands to Polynesia                     | 1  |
| Confined to Indian Ocean and Malayan Seas                    | 27 |
| Western species:—  | 4  |
| Extending from Africa to Australia:—                         | 2  |
| In both Africa and Mascarenes                                | 1  |
| In Mascarenes, not in Africa                                 | 1  |
| Extending from Africa to Malaya only                         | 2  |
| In Continental Africa, not in Mascarenes                     | 1  |
| In Mascarenes, not in Africa                                 | 1  |
| Eastern species:—  | 6  |
| Extending from Australia to India                            | 3  |
| Extending from Australia to the Coco Group                   | 3  |
| Central species:—  | 17 |
| Extending from India to Malaya                               | 8  |
| Extending from Coco Group to Malaya                          | 5  |
| Extending from Coco Group to Nicobars only                   | 4  |

TOTAL number of "Littoral" species. 80

In discussing the inland "immigrant" species the first agency to be considered is that of winds. This influence must here be stronger



| SPECIES.                       | S. E. Asia. |        |             |         |            |            |          |            |                |
|--------------------------------|-------------|--------|-------------|---------|------------|------------|----------|------------|----------------|
|                                | Africa.     | India. | Indo-China. | Malaya. | Australia. | Polynesia. | America. | Narcondam. | Barren Island. |
| Anodendron paniculatum         | ...         | x      | [x]         | x       |            |            |          |            |                |
| Chonemorpha macrophylla        | ...         | x      | [x]         | x       |            |            |          |            |                |
| 10. Hoya parasitica            | ...         |        | [x]         |         |            |            |          |            |                |
| Hoya diversifolia              | ...         |        | x           | x       |            |            |          |            |                |
| Dischidia nummularia           | ...         |        | x           | x       |            |            |          |            |                |
| Oroxylum indicum               | ...         |        | x           | x       |            |            |          |            |                |
| Heterophragma adenophyllum     | ...         |        | x           | x       |            |            |          |            |                |
| 15. Aristolochia tagala        | ...         | x      | x           | x       |            |            |          |            |                |
| Dendrobium secundum            | ...         |        | x           | x       |            |            |          |            |                |
| [Calanthe veratrifolia]        | ...         | x      | [x]         | x       |            |            |          |            |                |
| Dorites Wightii                | ...         |        | x           | x       |            |            |          |            |                |
| Aërides multiflorum            | ...         | x      | x           | x       |            |            |          |            |                |
| 20. Pholidota imbricata        | ...         | x      | x           | x       |            |            |          |            |                |
| Dioscorea glabra               | ...         |        | x           | x       |            |            |          |            |                |
| Dioscorea pontaphylla          | ...         | x      | x           | x       |            |            |          |            |                |
| Gloriosa superba               | ...         |        | x           | x       |            |            |          |            |                |
| [Ischæmum ciliare]             | ...         |        | x           | x       |            |            |          |            |                |
| 25. [Andropogon contortus]     | ...         | x      | x           | x       |            |            |          |            |                |
| Davallia solida                | ...         |        | [x]         | x       |            |            |          |            |                |
| Adiantum lunulatum             | ...         | x      | x           | x       |            |            |          |            |                |
| Polypodium irioides            | ...         | x      | x           | x       |            |            |          |            |                |
| Polypodium adnascens           | ...         | x      | x           | x       |            |            |          |            |                |
| 30. Polypodium quercifolium    | ...         |        | x           | x       |            |            |          |            |                |
| Vittaria elongata              | ...         | x      | x           | x       |            |            |          |            |                |
| Acrostichum scandens           | ...         |        | x           | x       |            |            |          |            |                |
| [Acrostichum appendiculatum]   | ...         | x      | x           | x       |            |            |          |            |                |
| Lygodium flexuosum             | ...         | x      | x           | x       |            |            |          |            |                |
| 35. Calymperes Dozyanum        | ...         | [x]    | [x]         | x       |            |            |          |            |                |
| Bryum coronatum                | ...         | x      | x           | x       |            |            |          |            |                |
| Collema nigrescens             | ...         | x      | x           | x       |            |            |          |            |                |
| Physcia obscura                | ...         | x      | x           | x       |            |            |          |            |                |
| Lentigin leucochrous           | ...         |        | [x]         | x       |            |            |          |            |                |
| 40. Lenzites deplanata         | ...         |        | x           | x       |            |            |          |            |                |
| Lenzites subferruginea         | ...         |        | x           | x       |            |            |          |            |                |
| Polyporus fulvus               | ...         |        | [x]         | x       |            |            |          |            |                |
| Polyporus xanthopus            | ...         | x      | x           | x       |            |            |          |            |                |
| Polyporus sanguineus           | ...         | x      | x           | x       |            |            |          |            |                |
| 45. Polyporus grammatocephalus | ...         | x      | x           | x       |            |            |          |            |                |
| Polyporus australis            | ...         |        | x           | x       |            |            |          |            |                |
| Hexagona pergamenea            | ...         | [x]    | [x]         |         |            |            |          |            |                |
| Hexagona sericeo-hirsuta       | ...         |        | [x]         |         |            |            |          |            |                |
| Hexagona tenuis                | ...         | x      | [x]         |         |            |            |          |            |                |
| 50. Dedælea flabellum          | ...         |        | x           | x       |            |            |          |            |                |
| Dedælea sanguinea              | ...         |        | x           | x       |            |            |          |            |                |
| Dedælea quercina               | ...         | x      | x           | x       |            |            |          |            |                |
| Dedælea concentrica            | ...         | x      | x           | x       |            |            |          |            |                |
| Thelephora in crustans         | ...         | x      | x           | x       |            |            |          |            |                |
| 55. Bovista lilacina           | ...         | x      | x           | x       |            |            |          |            |                |
| Hirneola polytricha            | ...         | x      | x           | x       |            |            |          |            |                |
| Daldinia vernicosa             | ...         | x      | x           | x       |            |            |          |            |                |
| Rhytisma sp. ...               | ...         |        | [x]         |         |            |            |          |            |                |



It will be seen that the majority of the species in this table are actually present in one or other of the two volcanic islands of the Andaman Sea, Narcondam and Barren Island, and even in these cases where they are not present allied species are. There is a *Bombax* in Narcondam and though its specific identity or otherwise with the Andamans one cannot be here discussed, it is evident that any *Bombax* may be wind-introduced. And whatever agency explains the presence of *Bombax* will, *pari passu*, explain that of *Eriodendron*.

Not a single orchid was found on Narcondam though on Barren Island two were found—a species of *Dendrobium* on trees on the outer cone, and *Pholidota imbricata*, which occurs at the top of the inner cone within the crater-cup where the ground is kept moist by the condensation of escaping steam. Then the *Hoyas* are both present in great abundance on the exposed rocks and tall trees of both islands. The most doubtful species undoubtedly are *Aristolochia tagala*, *Gloriosa superba*, and, especially, the two species of *Dioscorea*. Yet these must all be immigrant. The writer has collected *Aristolochia tagala* on Batti Malv, a small outlying uninhabited fragment of the Nicobar Group, off Barren Island, and on Narcondam. And even if it be claimed that on Batti Malv the species may be a remanent one on the other two islands it, like every other species, *must* be immigrant. The case of *Gloriosa superba* has already been discussed when dealing with the species introduced by the sea. The *Dioscoreas* are still more difficult to explain, but it hardly seems as if they could be bird-introduced, and it is almost as difficult to think that they have been introduced by the sea. They are never littoral, being even in these islands strictly confined to the higher dry ridges. Yet they are certainly not necessarily remanent, for the writer has collected not these only but a third species, *Dioscorea bulbifera*, or at all events a bulbiferous one, which is present along with these two in great quantity in Narcondam and especially in Barren Island. In both these islands the species must all be immigrant and from the physiographical history of Barren Island should there be, biologically speaking, extremely recently so. Though no *Strophanthus* occurs in Barren Island, an *Aganosma* is common there. The distribution of the *Cryptogams* of this class calls for little remark, the peculiarities displayed in this respect by the *Fungi* being probably altogether owing to this class being imperfectly known in most floras. The presence, for instance, of two species here that are recorded only from North America probably implies that they are both in reality cosmopolitan or nearly so.

To the 58 species enumerated above should be added six imperfectly represented *Cryptogams*, giving a total of 64 species; the following table contains an analysis of their distribution.

TABLE XVIII. *Analysis of the distribution of Wind-introduced species.*

|   |    |
|---|----|
| Species present in both hemispheres :—                                    | 21 |
| Cosmopolitan in the tropics ( <i>Phanerog.</i> 3 ; <i>Cryptog.</i> 12) .. | 15 |
| Almost Cosmopolitan ( <i>Phanerog.</i> 1 ; <i>Cryptog.</i> 5) ..          | 6  |
| In Africa, Asia, Polynesia, America ( <i>Cryptog.</i> ) ..                | 2  |
| In Africa, Asia, America ( <i>Phanerog.</i> ) ..                          | 1  |
| In Asia, Australia, America ( <i>Cryptog.</i> ) ..                        | 1  |
| In Asia, America ( <i>Cryptog.</i> ) ..                                   | 2  |
| Confined to Old World :—  | 43 |
| { In Africa, Asia, Australia, Polynesia ( <i>Cryptog.</i> ) ..            | 1  |
| { In Africa, Asia, Australia ( <i>Cryptog.</i> ) ..                       | 1  |
| { In Africa, Asia ( <i>Cryptog.</i> ) ..                                  | 1  |
| { In Asia, Australia, Polynesia ( <i>Cryptog.</i> ) ..                    | 3  |
| { In Asia, Australia, ( <i>Phanerog.</i> ) ..                             | 2  |
| { In Asia, Polynesia ( <i>Cryptog.</i> ) ..                               | 1  |
| Confined to Asia, ( <i>Phanerog.</i> 18 ; <i>Cryptog.</i> 16) ..          | 34 |
| TOTAL of possibly wind-introduced species :—                              | 64 |
| Phanerogams ..  | 25 |
| Cryptogams ..   | 39 |

We thus see that 32 per cent. of the species are cosmopolitan, but that at the same time as many as 53 per cent. are confined to South-Eastern Asia, figures which tend to shew that the agency of wind appears to be less active than we might expect. So far as the more local distribution is concerned we find that 40 species, or 62 per cent., may have reached the islands either from Indo-China or from Malaya ; 10 species, or 15 per cent., appear to be local species ; 3 species appear to have reached the islands from Malaya and one must have come either from Malaya or Ceylon, these four are, however, all *Cryptogams* and may possibly yet be found in Indo-China. Even if it be assumed that these do not occur in Burma, it leaves the south-west monsoon responsible for the introduction of only  $6\frac{1}{2}$  per cent. of this group of species. The remaining 10 species, or about 16 per cent. of the class, have more probably been introduced by the north-east monsoon, a circumstance that might be expected, seeing that this monsoon blows from the direction of the nearest land. And as this is the case it will follow that the probability is strong that most of the species which may, so far as their present distribution indicates, have come either from Indo-China or Malaya have in reality come from the north-east. The only species of the kind for which this is doubtful is *Chonemorpha macrophylla*, which, though abundant in India and in the Himalaya, and equally so in Malaya and in the Andamans, has not yet been recorded from any part of Indo-China to the east of Khasia and Sylhet.

The last group of introduced species—those carried by birds—has now to be considered. In discussing this it is necessary to distinguish



there all occur in India and Indo-China also, while two that occur in India and Indo-China but do not occur in Malaya must have been introduced from the north. This being the case the probability is that the others have mainly been introduced from the same direction, a circumstance quite in accordance with expectation, since it is from the north that the stream of migration of marsh- and water-birds annually flows. During our visits to the islands snipe were found in the meadow near the lake on Great Coco, while teal and other water-birds frequented the lake itself and abounded in the lagoon on Little Coco.

TABLE XX. *Analysis of distribution of Marsh and Aquatic species.*

|   |    |
|---|----|
| Present in both Hemispheres :—                                | 7  |
| Cosmopolitan in the tropics : . . . . .                       | 6  |
| Nearly cosmopolitan (absent from <i>Polynesia</i> ) . . . . . | 1  |
| Confined to Eastern Hemisphere . . . . .                      | 9  |
| Africa, Asia, Australia . . . . .                             | 3  |
| Africa, Asia . . . . .  | 2  |
| Confined to South-eastern Asia . . . . .                      | 4  |
| TOTAL species probably introduced by water-birds . . . . .    | 16 |

The second kind of species that may be introduced by becoming attached externally to birds is somewhat more difficult to deal with. *Urena lobata*, which is here clearly not a weed, may have been introduced in this way: its fruits sticking, burr-like, to the feathers of some bird; *Buettneria antilamanensis*, might also have been thus introduced, though this is not so probable as in the other case. Three of the *Desmodia*—*Desmodium triquetrum*, *D. luxiflorum* and *D. polycarpon*—may very well owe their introduction to this mode of dispersal. *Boerhaavia repens*, as has already been said, is probably sea-introduced, though there is no reason why it may not partly owe its dispersal to bird-agency. Its habitat on these islands is always the rocky headlands or isolated rocks along the coast on which sea-birds sit to devour the *Grapsus* crabs they capture on the wave-washed ledges below, and nothing is more likely than that the fruits may become at times attached to their feet and be carried at least from point to point along the coast. The *Pisonias* may both very well have been introduced in this fashion, though it is less likely as regards *P. aculeata* than as regards *P. excelsa*. From what has been already said of this tree in discussing it among the "littoral" species, it will be evident that its fruits are of such a nature as to admit of their being carried for great distances attached to a bird's feet or body, if only the bird should happen to come in contact with them, and the objection that scraping-birds, which might do so, are not often migratory, while frugivorous birds, which are migratory, would not come in contact with the fruits because they are not likely to alight on a *Pisonia*, is not a valid one.

Though many such birds, as for instance *Carpophaga bicolor*, appear always to feed on trees and therefore would probably very rarely come in contact with *Pisonia* fruits, many others, as for instance *Calanias nicobarica*, appear to feed as much or more on the ground, on fallen ripe fruits, as on the trees that bear the fruits they eat.\* And in such a case there is no doubt that they might very easily come in contact with *Pisonia* fruits. Though essentially a beach-forest tree, the writer has collected specimens of *Pisonia excelsa* (and the tree was plentiful where he did so) three or four miles inland and 250—300 feet above sea-level; some mode of dispersal other than, or at any rate supplementing, ocean-dispersal, must therefore, as has already been pointed out, be postulated as regards this species. Of the grasses placed in this list *Andropogon contortus* already mentioned as possibly wind-introduced, much more probably owes its presence to this mode of introduction. *Oplismenus compositus* is also sufficiently well endowed to render this mode of introduction likely. The only *Cryptogam* likely to have been thus introduced is *Acrostichum appendiculatum*, the spores of which might easily get brushed off by the feathers of a bird walking through a patch of it. This would also apply to the seeds of *Calanthe*.

The following table gives the names and distribution of the species likely to be thus introduced or likely to have their local dispersion assisted by this means.

TABLE XXI. *Distribution of species probably introduced attached to the feet or feathers of land-birds.*

| SPECIES.                               | S. E. ASIA. |        |             |         |            |            |          |
|--|-------------|--------|-------------|---------|------------|------------|----------|
|  | Africa.     | India. | Indo-China. | Malaya. | Australia. | Polynesia. | America. |
| <i>Urena lobata</i> ...                | x           | x      | x           | x       | x          | x          | x        |
| [ <i>Buettneria andamanensis</i> ] ... | x           | x      | x           | x       | x          | x          | x        |
| <i>Desmodium triquetrum</i> ...        | x           | x      | x           | x       | x          | x          | x        |
| <i>Desmodium laxiflorum</i> ...        | x           | x      | x           | x       | x          | x          | x        |
| 5. <i>Desmodium polycarpum</i> ...     | x           | x      | x           | x       | x          | x          | x        |
| [ <i>Loranthus longiflorus</i> ] ...   | x           | x      | x           | x       | x          | x          | x        |
| [ <i>Boerhaavia repens</i> ] ...       | x           | x      | x           | x       | x          | x          | x        |
| [ <i>Pisonia aculeata</i> ] ...        | x           | x      | x           | x       | x          | x          | x        |
| <i>Pisonia excelsa</i> ...             | x           | x      | x           | x       | x          | x          | x        |
| 10. <i>Calanthe veratrifolia</i> ...   | x           | x      | x           | x       | x          | x          | x        |
| <i>Oplismenus compositus</i> ...       | x           | x      | x           | x       | x          | x          | x        |
| <i>Andropogon contortus</i> ...        | x           | x      | x           | x       | x          | x          | x        |
| <i>Acrostichum appendiculatum</i> ...  | x           | x      | x           | x       | x          | x          | x        |

\* This at least was the writer's experience in Batti Malv, the small uninhabited almost inaccessible island of the Nicobar Group already referred to, where *Calanias nicobarica* breeds, and on which thousands of individuals of this species congregate.

The list is so short that an analysis of it is unnecessary; it is sufficient to note that the possibility of introduction from Malaya or from Indo-China is, so far as its evidence goes, evenly balanced.

While the two lists probably include all the species usually introduced by being attached externally to birds they do not exhaust all the possibilities of the case. For, if the mud of a marsh may fix the seeds or fruits of paludine species to the feet or head of wading-birds, other substances may fix the seeds of forest species to the bodies of forest-birds. There is almost no limit to the number of species that might be suggested as introduced in this way, provided their seeds be sufficiently small; this very circumstance, combined with the necessarily hypothetical nature of the subject, makes it impossible to attempt the suggestion of this mode of dispersal in connection with any particular species.\*

The next kind of "bird-introduced" species to be considered—those introduced in consequence of having been eaten—may also be conveniently divided into two sub-groups; one consisting of species where dissemination by birds is an every-day process, the other consisting of species that can only be occasionally disseminated in this fashion since the process implies the destruction of the bird itself.

The first sub-group corresponds fairly closely with those species

\* The following facts will shew that, though necessarily hypothetical, the subject is not far-fetched but is, on the contrary, highly deserving of attention. When in Narcondam the writer was particularly anxious to obtain the seeds of a species of *Bombax* present there, for sowing at Calcutta; for some days the search was hopeless because the capsules as they ripen are broken open and the seeds are eaten by a species of Horn-bill that is common in the island, while any seeds that escape the birds and fall to the ground are devoured by the rats that swarm in the place. At length under one tree, where there happened to be on the under-growth one or two large spider's webs, four seeds were found sticking in these webs; these were the only seeds he was fortunate enough to obtain; they were brought to Calcutta, germinated there, and the four young trees are now alive in the Botanic Garden. This will shew that seeds easily may, and at times do, stick in spider's webs.

In spring 1890 a Barbet was found lying on the ground in the Botanic Garden unable to fly; on being picked up and examined it was found that its left wing and left leg were fixed together by means of a spider's web; on freeing these it was found that the toes of its left foot were further bound up in a ball and the flight-feathers were firmly tied together. When finally completely freed from its entanglement the bird flew away, frightened, but physically uninjured. This will shew that birds do sometimes come in contact with spider's webs and that these are capable not merely of fixing objects to a bird's feathers but of fixing these feathers so that the bird itself cannot move them.

All that is therefore required in order to establish the truth of the hypothesis is direct observation of a bird having come in contact with a spider's web which happened to have seeds lodged in it at the time, and of its carrying away seeds and web together.

that have pulpy fruits with a hard stone or with hard indigestible seeds. It cannot, however, be held to include all these, for though birds do eat the pulpy part of the fruits of *Canarium*, *Spondias* and *Dracontomelum*, the stones of these are too large to be swallowed; probably therefore some other mode of dispersal must be held accountable for the presence in these islands of species of those genera. For *Dracontomelum* introduction by the sea has been suggested, though doubtfully; the others are left, with some reluctance, among the "remanent" species. There are other species for which this agency is only doubtful, such as *Miliusa*, the fruits of which do not look very inviting—some *polyalthias* are, however, so dispersed, e. g., *P. longifolia* by frugivorous bats; *Physalis minima* might well enough have been introduced in this way, but is, all things considered, more probably sea-introduced; some of the *Convolvulaceæ* may also have been thus introduced. Moreover it must not be forgotten that indirect introduction in this way is not impossible. As has been pointed out, some of the fruit-eating pigeons are ground-feeding creatures, and if a sticky pulpy fruit should fall into a patch of *Oplismenus*, *Panicum*, *Aneilema*, or other small-fruited or -seeded herbaceous ground-species, the seeds or fruits of these may become attached to the fruits in question and, if then swallowed unnoticed by a fruit-eating bird, be voided uninjured along with the stone or seeds of the fruit itself and subsequently germinate. The subjoined table gives a list of all the species probably directly introduced; the indirect method, as being too hypothetical for discussion here, is not mentioned in connection with any particular species.

As in the case of species introduced by wind, the occurrence of species of this kind in the islands of Narcondam and Barren Island is given; these being islands for which it is necessary at the outset to exclude from consideration any hypothetical "remanent" element.\*

\* This part of the list is not so complete as it might be, since owing to the pressure of other duties the writer has not yet been able to complete the examination of the species collected by him in those islands in April 1891. This much may be said, that all the species quoted as occurring there do occur. But many of the others though not present are represented by nearly allied species and by species of this kind. There is for example at least one *Grewia* in Narcondam, there are several *Rubiacæ* and there is an *Amorphophallus*. In Narcondam too there is a species of *Strychnos*, while a species of *Eugenia* is common in Barren Island. These two isolated localities therefore present two genera, with species that have fruits of the kind now discussed, of which no representatives were met with in the Coco Group. Similarly Batt Malv, equally isolated, and quite uninhabited, has an *Alangium* and a *Datura*; it may therefore be repeated that this list by no means overstates the possibilities of the agency in such a locality as this.

**TABLE XXII.** *Species probably introduced by fruit-eating birds.*

| SPECIES.                               | S. E. ASIA. |        |             |         |            |            |          |            |                |  |
|--|-------------|--------|-------------|---------|------------|------------|----------|------------|----------------|--|
|  | Africa.     | India. | Indo-China. | Malaya. | Australia. | Polynesia. | America. | Narcoudan. | Barren Island. |  |
| [ <i>Miliusa</i> sp.] ...              | ...         | ...    | [x]         | ...     | ...        | ...        | ...      | ...        | ...            |  |
| <i>Capparis espiaria</i> ...           | ...         | x      | x           | x       | ...        | ...        | ...      | x          | x              |  |
| <i>Capparis tenera</i> ...             | ...         | ...    | x           | x       | ...        | ...        | ...      | x          | x              |  |
| <i>Grewia laevigata</i> ...            | ...         | x      | x           | x       | ...        | ...        | ...      | x          | x              |  |
| 5. <i>Grewia Microcos</i> ...          | ...         | ...    | x           | x       | ...        | ...        | ...      | x          | x              |  |
| <i>Glycosmis pentaphylla</i> ...       | ...         | ...    | x           | x       | ...        | ...        | ...      | x          | x              |  |
| <i>Garuga pinnata</i> ...              | ...         | x      | x           | x       | ...        | ...        | ...      | x          | x              |  |
| <i>Aglaia andamanica</i> ...           | ...         | ...    | [x]         | ...     | ...        | ...        | ...      | x          | x              |  |
| <i>Cana-jern Rhoe-dii</i> ...          | ...         | x      | x           | x       | ...        | ...        | ...      | x          | x              |  |
| 10. <i>Sarcostigma edule</i> ...       | ...         | ...    | [x]         | ...     | ...        | ...        | ...      | x          | x              |  |
| <i>Salacia prinoi-des</i> ...          | ...         | x      | x           | x       | ...        | ...        | ...      | x          | x              |  |
| <i>Zizyphus CEnoplia</i> ...           | ...         | ...    | x           | x       | ...        | ...        | ...      | x          | x              |  |
| <i>Vitis pentagona</i> ...             | ...         | ...    | x           | x       | ...        | ...        | ...      | x          | x              |  |
| <i>Vitis carnosa</i> ...               | ...         | ...    | x           | x       | ...        | ...        | ...      | x          | x              |  |
| 15. <i>Vitis pedata</i> ...            | ...         | x      | x           | x       | ...        | ...        | ...      | x          | x              |  |
| <i>Leea hirta</i> ...                  | ...         | ...    | x           | x       | ...        | ...        | ...      | x          | x              |  |
| <i>Erioglossum edule</i> ...           | ...         | ...    | x           | x       | ...        | ...        | ...      | x          | x              |  |
| <i>Allophylus Cobbe</i> ...            | ...         | ...    | x           | x       | ...        | ...        | ...      | x          | x              |  |
| <i>Sapindus Danura</i> ...             | ...         | ...    | x           | x       | ...        | ...        | ...      | x          | x              |  |
| 20. <i>Pometia tomentosa</i> ...       | ...         | ...    | [x]         | ...     | ...        | ...        | ...      | x          | x              |  |
| <i>Odina Wodier</i> ...                | ...         | ...    | x           | x       | ...        | ...        | ...      | x          | x              |  |
| <i>Semecarpus subpanduriformis</i> ... | ...         | ...    | x           | x       | ...        | ...        | ...      | x          | x              |  |
| <i>Semecarpus heterophylla</i> ...     | ...         | ...    | [x]         | ...     | ...        | ...        | ...      | x          | x              |  |
| <i>Memexylon edule</i> ...             | ...         | ...    | [x]         | x       | ...        | ...        | ...      | x          | x              |  |
| 25. <i>Modecca cordifolia</i> ...      | ...         | ...    | [x]         | x       | ...        | ...        | ...      | x          | x              |  |
| <i>Trichosanthes palmata</i> ...       | ...         | ...    | x           | x       | ...        | ...        | ...      | x          | x              |  |
| <i>Mussaenda calycina</i> ...          | ...         | ...    | x           | x       | ...        | ...        | ...      | x          | x              |  |
| <i>Pavetta indica</i> ...              | ...         | ...    | x           | x       | ...        | ...        | ...      | x          | x              |  |
| <i>Psychotria adenophylla</i> ...      | ...         | ...    | x           | x       | ...        | ...        | ...      | x          | x              |  |
| 30. <i>Pæderia fortida</i> ...         | ...         | ...    | x           | x       | ...        | ...        | ...      | x          | x              |  |
| <i>Ardisia humilis</i> ...             | ...         | ...    | x           | x       | ...        | ...        | ...      | x          | x              |  |
| <i>Bauwolfia serpentina</i> ...        | ...         | ...    | x           | x       | ...        | ...        | ...      | x          | x              |  |
| <i>Erycibe paniculata</i> ...          | ...         | ...    | x           | x       | ...        | ...        | ...      | x          | x              |  |
| [ <i>Physalis minima</i> ] ...         | ...         | x      | x           | x       | ...        | ...        | ...      | x          | x              |  |
| <i>Myristica Irya</i> ...              | ...         | [x]    | x           | x       | ...        | ...        | ...      | x          | x              |  |
| 35. <i>Myristica glauca</i> ...        | ...         | ...    | [x]         | x       | ...        | ...        | ...      | x          | x              |  |
| <i>Dehaasia Kurzii</i> ...             | ...         | ...    | [x]         | x       | ...        | ...        | ...      | x          | x              |  |
| <i>Bridelia tomentosa</i> ...          | ...         | ...    | x           | x       | ...        | ...        | ...      | x          | x              |  |
| <i>Bridelia Kurzii</i> ...             | ...         | ...    | [x]         | x       | ...        | ...        | ...      | x          | x              |  |
| <i>Flueggea microcarpa</i> ...         | ...         | x      | x           | x       | ...        | ...        | ...      | x          | x              |  |
| 40. <i>Phyllochlamys spinosa</i> ...   | ...         | ...    | x           | x       | ...        | ...        | ...      | x          | x              |  |
| <i>Plecospermum andamanicum</i> ...    | ...         | ...    | [x]         | ...     | ...        | ...        | ...      | x          | x              |  |
| <i>Ficus Benjamin</i> ...              | ...         | ...    | x           | x       | ...        | ...        | ...      | x          | x              |  |
| <i>Ficus Rumphii</i> ...               | ...         | ...    | x           | x       | ...        | ...        | ...      | x          | x              |  |
| <i>Ficus retusa</i> ...                | ...         | ...    | x           | x       | ...        | ...        | ...      | x          | x              |  |



| SPECIES.                            |     | Africa. | S. E. ASIA. |             |         |            | Polynesia. | America. | Narcondam. | Barren Island. |
|-------------------------------------|-----|---------|-------------|-------------|---------|------------|------------|----------|------------|----------------|
|                                     |     |         | India.      | Indo-China. | Malaya. | Australia. |            |          |            |                |
| 45. <i>Ficus brevicuspis</i> ...    | ... | -       | -           | [x]         | x       | -          | -          | -        | -          | -              |
| <i>Ficus callosa</i> ...            | ... | -       | x           | x           | x       | -          | -          | -        | -          | -              |
| <i>Ficus hispida</i> ...            | ... | -       | x           | x           | x       | x          | -          | -        | x          | x              |
| <i>Ficus grisea</i> ...             | ... | -       | -           | x           | x       | -          | -          | -        | -          | -              |
| <i>Antiaris toxicaria</i> ...       | ... | -       | x           | x           | x       | -          | -          | -        | -          | -              |
| 50. <i>Artocarpus Gomeziana</i> ... | ... | -       | -           | [x]         | x       | -          | -          | -        | x          | -              |
| <i>Zingiber</i> sp. ...             | ... | -       | -           | [x]         | x       | -          | -          | -        | -          | -              |
| <i>Ocotea speciosa</i> ...          | ... | -       | x           | x           | x       | -          | -          | -        | -          | -              |
| <i>Smilax macrophylla</i> ...       | ... | -       | x           | x           | x       | -          | -          | -        | -          | -              |
| <i>Asparagus racemosus</i> ...      | ... | -       | x           | x           | x       | -          | -          | -        | -          | -              |
| 55. <i>Draena spicata</i> ...       | ... | -       | -           | x           | x       | -          | -          | -        | -          | -              |
| <i>Amorphophallus</i> sp. ...       | ... | -       | -           | [x]         | x       | -          | -          | -        | x          | -              |
| <i>Pothos scandens</i> ...          | ... | -       | x           | x           | x       | -          | -          | -        | -          | -              |

The most remarkable feature of the list is that it gives us for the first time a well-defined group of species none of which extend to America or even to Polynesia, and only two of which extend to Africa, though no fewer than 15, or 27 per cent., extend to Australia. The remaining 40 are confined to South-Eastern Asia. As regards their more local distribution there, 17, or 31 per cent., are confined to lands lying to the east of the Sea of Bengal, while 3 more occur in Ceylon but not in India, a circumstance which perhaps indicates that birds which feed on these species pass from Malaya to Ceylon but do not visit India. If this be the case the agency of frugivorous birds may partly explain the existence of a Ceylon element in the flora of the Andamans generally, a circumstance that has, as already said, been made the subject of remark by the late Mr. Kurz, (*Report on the Vegetation of the Andaman Islands*, p. 15); this point will be more fully discussed below.

As many as 36 species, or 64 per cent., occur both in Indo-China and in Malaya; as 15 pass southward to Australia while 14 pass northward to South China, and 5 pass southward to Malaya without going north to Indo-China, while 5 reach the islands from Indo-China without extending to Malaya, we may conclude that, though this element in the flora is distinctly non-Indian, the Indo-Chinese and Malay-Australian influences are, so far as it is concerned, evenly balanced.

Since the active agency in the dispersal of these species is that of

fruit-eating birds, it ought to be possible to show that the known migrations of these creatures sufficiently explain their distribution. For all the species that occur in the Malay Archipelago this is extremely easy to do. The western half of the Malay Archipelago is particularly rich in fruit-eating pigeons and, as this area lies on both sides of the equator, the annual changes of season must cause the fruit-eating species, following the fruits on which they feed as these become mature, to oscillate from side to side of the equator. The same condition will ensure further migration from Southern Malaya to North Australia and *vice versa* on the one hand, and from Northern Malaya to the Nicobars and Andamans and *vice versa* on the other. It is not necessary to suppose that any particular fruit-eating bird must range from one end to the other of the area here considered, though some species, like *Calenas nicobarica*, which extends from these islands to New Guinea, nearly or altogether do so; it is sufficient to know that such birds are seasonal visitants in any given locality, as is true of *Carpophaga bicolor*, *Carpophaga insularis*, *Calenas nicobarica*, and many other species in those very islands; the region depleted of one set of species by the migration of these towards the north is filled with individuals representing another set coming from an area still further south. By the necessary over-lapping of the ranges of migration of different birds a continuous chain of dispersal is kept up and, even if Malayan birds never go further north than these islands, the process is continued by the arrival from and departure to the opposite point of the compass, of Indo-Chinese species; it is therefore not surprising to find that, where the climatic conditions still continue favourable, the same bird-distributed species of *Phanerogams* extend from North Australia through all the intervening areas to Southern China. This being so, the appearance of the same species in India and in Malaya, which is the case in 33 species, or 58 per cent., of the group, is simply explained. Certain species of birds, instead of only passing southward from China to Indo-China, pass also south-westward to the Eastern Himalaya or to the Assam valley, from whence these, or other, species of birds carry the seeds of the plants in question still further south-westward into peninsular India. This may explain also why certain species, like *Pæderia fatida*, extend from Malaya northwards to Indo-China on the eastern line of migration, but on the western extend only southward to the Eastern Himalaya and not into India; the species of birds that eat their fruits may perhaps not migrate on the more western line of migration further south than the Himalayan slopes. The same reasoning applies to those species, of which there are 3, or about 5 per cent., that extend to Southern India on the western line of migration but do not go as far as Malaya on the

eastern line. The species that are common to these islands and to Ceylon are more difficult to explain. If we felt certain that they are species of distinctively Ceylonese type and that they occur, out of Ceylon, only in these islands, we might suppose that Ceylon birds are occasionally driven by storms as far as the Coco Group and consider the dispersal of the seeds of such species as one of the indirect sequels of cyclones of unusual severity. The birds even need not be different, as regards species, from those commonly found in the Andamans; they need only be individuals that have followed the western instead of the eastern line of migration southward, and that under exceptional circumstances have passed directly from one line of migration to the other, carrying in their crops seeds or fruits that are characteristic of the line of migration from which they have been driven. If the species are not of Ceylonese type, their occurrence both in Ceylon and the Cocos may, as has been said already, only indicate that they have been brought directly from Malaya or Australia by southern birds that migrate to Ceylon as well as to the Coco Group but do not go as far north as peninsular India.

The remaining sub-group consists of species with seeds or fruits that are eaten by birds of different kinds, not for the sake of any pulpy portion, but on account of the nutritious properties of the whole fruit or seed. We have to realize that the dispersal in this case is not, as in the case of pulpy fruits the seeds of which are afterwards voided, an ordinary circumstance, inasmuch as the seeds are eaten for their own sake and are of necessity digested by the birds that eat them. But though it is not perhaps a common occurrence—the numbers of migrating grain- or seed-eating individuals considered—for newly-arrived birds to be killed, there is no doubt that a certain proportion, tired out by their long flight, must fall victims to raptorial birds immediately on their arrival, the grains or seeds that their crops may contain falling aside and possibly germinating. Besides this means of introducing such species, and, even if the results be slight, it must nevertheless be in constant operation, there is the further possibility of similar species being introduced during severe cyclones, owing to birds that have been driven to land being captured and devoured, while exhausted by the buffeting of the tempest, by birds or beasts of prey. In this way not only the grain- or seed-eating species that ordinarily visit the islands, but species both of this and of the fruit-eating class that do not usually reach the group, may conceivably arrive and as conceivably bring with them the seeds of plants that birds which are normal visitants have no opportunity of meeting with or may not care to eat. It has to be admitted, however, that species for which this mode of introduction

is claimed may with some degree of reason be looked upon as distinctly, though indirectly, introduced by wind.\*

The species for which this mode of introduction is conceivable are given below. That many of them *must* be introduced species their presence in Narcondam and Barren Island testifies; it is therefore, as regards these, somewhat on the principle of exclusion that they are referred to this class, and for some of them, such as *Abrus precatorius*, it is doubtful if it be not rather the sea that is responsible for their appearance.

TABLE XXIII. *Species perhaps introduced by seed- and grain-eating birds.*

| SPECIES.                          |     |     |     |     | S. E. ASIA. |        |             |         | Australia. | Polynesia. | America. |
|-----------------------------------|-----|-----|-----|-----|-------------|--------|-------------|---------|------------|------------|----------|
|                                   |     |     |     |     | Africa.     | India. | Indo-China. | Malaya. |            |            |          |
| <i>Cyclea peltata</i>             | ... | ... | •   | ... | x           | x      | x           | x       | x          | x          | x        |
| <i>Abrus precatorius</i>          | ... | ... | ... | ... | x           | x      | x           | x       | x          | x          | x        |
| <i>Abrus pulchellus</i>           | ... | ... | ... | ... | x           | x      | x           | x       | x          | x          | x        |
| <i>Mucuna pruriens</i>            | ... | ... | ... | ... | x           | x      | x           | x       | x          | x          | x        |
| 5. <i>Acacia pennata</i>          | ... | ... | ... | ... | x           | x      | x           | x       | x          | x          | x        |
| <i>Albizia Lebbek</i>             | ... | ... | ... | ... | x           | x      | x           | x       | x          | x          | x        |
| <i>Albizia procera</i>            | ... | ... | ... | ... | x           | x      | x           | x       | x          | x          | x        |
| <i>Ipomoea Turpethum</i>          | ... | ... | ... | ... | x           | x      | x           | x       | x          | x          | x        |
| <i>Pollia zorzogonensis</i> var.  | ... | ... | ... | ... | x           | x      | [x]         | x       | x          | x          | x        |
| 10. <i>Commelina obliqua</i>      | ... | ... | ... | ... | x           | x      | x           | x       | x          | x          | x        |
| [ <i>Aneilema ovatum</i> ]        | ... | ... | ... | ... | x           | x      | x           | x       | x          | x          | x        |
| <i>Panicum colonum</i>            | ... | ... | ... | ... | x           | x      | x           | x       | x          | x          | x        |
| <i>Panicum Helopus</i>            | ... | ... | ... | ... | x           | x      | x           | x       | x          | x          | x        |
| <i>Panicum javanicum</i>          | ... | ... | •   | ... | x           | x      | [x]         | x       | x          | x          | x        |
| 15. [ <i>Panicum ciliare</i> ]    | ... | ... | ... | ... | x           | x      | x           | x       | x          | x          | x        |
| [ <i>Ischaemum ciliare</i> ]      | ... | ... | ... | ... | x           | x      | x           | x       | x          | x          | x        |
| [ <i>Eleusine indica</i> ]        | ... | ... | ... | ... | +           | x      | x           | x       | x          | x          | x        |
| [ <i>Dendrocalamus strictus</i> ] | ... | ... | ... | ... | x           | x      | x           | x       | x          | x          | x        |

† That there is nothing extravagant in claiming this as a possible means of introduction, the following passage (which refers, as it happens, to one of the islands under discussion), will sufficiently prove:—"Mr. Hawkins told us that when the storm was over \* \* \* \* \* every hollow of the island, war, tenanted by hundreds of numbed or wounded sea-birds of all descriptions (such as he had never seen near the island before or since) so terrified or exhausted that he picked up or took home several of them to the light-house to show to his wife. Mixed with these were a certain number of pigeons, parrots, and other land-birds, but the great majority were Petrels, Terns, Whale-birds and such like sea-fowl with which his experience as a sailor in southern seas had made him familiar. Most of these birds ultimately recovered and left the island, but many of them hung about it for weeks, and for many days remained so tame that they would not move from the ground or the rocks,

Of the above, *Cyclea peltata*, *Abrus precatorius*, *Acacia pennata*, *Albizia Lebbek*, *Albizia procera*, *Ipomœa Turpethum*, and *Polia zorzogonensis* occur in Narcondam. With few exceptions they are widely distributed species; five are cosmopolitan, one extends throughout the Eastern Hemisphere and thence to Australia and Polynesia, two extend from Africa and Asia to Australia, one occurs in Asia and Africa, one in Asia and Australia; only eight species, or less than half of the group, are confined to South-Eastern Asia. Of these latter, three are confined to the countries east of the Bay of Bengal; two of them, *Panicum javanicum*, and the particular variety of *Polia zorzogonensis* that occurs, are moreover distinctively Malayan, as opposed to Indo-Chinese, plants. On the other hand one species, *Dendrocalamus strictus*, is as distinctively an Indian or Indo-Chinese plant.

We have now in conclusion to consider the "remanent" species, a list of which is given in the subjoined table; in a few cases where introduction is remotely possible the agency that may have been responsible is indicated.

"

"where they happened to alight, to make way for the keeper or his men." (*Hume; Stray Feathers*, vol. ii, p. 113-4.)

In this passage we have all the evidence that is required to show that not merely the usual visitants but even unusual ones may at times be driven to, or seek shelter on, these islands when in an exhausted or injured condition, and to show that this is as likely to happen to grain-, pulse-, and seed-eating species as to fruit-, or fish-, crustacean- or mollusc-eating ones. It is of little moment that the fish- or crustacean-eating species must always be the more numerous, if we know that species of the other kind are at any time driven to the islands in this state. All of these exhausted and injured creatures certainly do not recover or escape destruction. As regards those that simply die, when the insects that abound have eaten all but their bones, the seeds that may have been contained in their crops must fall aside and may germinate and grow. And as regards those that are killed and devoured it would be remarkable if a few of the seeds in their crops did not thus fall aside and obtain an opportunity of germinating.

Even if no other creature that exists in these islands were capable of, or likely to, catch and eat such exhausted birds, the presence of a large lizard—*Hydrosaurus salvator*—which is very common, is sufficient to account for the destruction of many of them. During our visit to Little Coco one of the officers of the "Investigator" shot two *Carpophaga bicolor*—right and left—by the side of the lagoon near the south end of the island. Before his attendant could reach the birds, which had fallen among the *Pandanus* bushes of the sea-fence, one of these lizards had already eaten all but the wings and head of one pigeon and had torn open the breast of the second ere it could be interrupted in its feast. On a previous occasion a *Hydrosaurus* was killed as it was apparently about to seize a Teal that had just been shot and had been laid down on a rock in the same lagoon. On opening up this creature its stomach was found to contain already a large land-crab, two fishes, and a quantity of grassy roots (apparently those of *Scirpus subulatus*).

TABLE XXIV. Possibly "Remanent" species of the Coco Island flora.

| SPECIES.                                    | Africa. | S. E. ASIA. |             |         |   | Australia. | Polynesia. | America. | Possibly introduced by |
|---|---------|-------------|-------------|---------|---|------------|------------|----------|------------------------|
|   |         | India.      | Indo-China. | Malaya. |   |            |            |          |                        |
| * <i>Milusa</i> sp. ...                     | ...     | -           | [x]         | -       | - | -          | -          | *        |                        |
| [ <i>Cyclea peltata</i> ] ...               | ...     | x           | [x]         | x       | - | -          | -          | -        | ? Birds.               |
| * <i>Antitaxis calocarpa</i> ...            | ...     | -           | [x]         | -       | - | -          | -          | -        |                        |
| <i>Alsodeia bengalensis</i> ...             | ...     | -           | x           | x       | - | -          | -          | -        |                        |
| 5. <i>Dipterocarpus pilosus</i> ...         | ...     | -           | -           | x       | - | -          | -          | -        |                        |
| <i>Dipterocarpus alatus</i> ...             | ...     | -           | -           | x       | - | -          | -          | -        |                        |
| <i>Sterculia villosa</i> ...                | ...     | -           | x           | -       | - | -          | -          | -        |                        |
| *[ <i>Sterculia rubiginosa</i> var.] ...    | ...     | -           | [x]         | -       | - | -          | -          | -        | ? Ocean.               |
| <i>Sterculia parviflora</i> ...             | ...     | -           | x           | x       | - | -          | -          | -        |                        |
| 10. <i>Sterculia alata</i> ...              | ...     | -           | x           | x       | x | -          | -          | -        |                        |
| <i>Sterculia colorata</i> ...               | ...     | -           | x           | x       | - | -          | -          | -        |                        |
| <i>Sterculia campanulata</i> ...            | ...     | -           | -           | x       | x | -          | -          | -        |                        |
| <i>Buettneria andamanensis</i> ...          | ...     | -           | [x]         | -       | - | -          | -          | -        |                        |
| Berrya <i>Ammonilla</i> ...                 | ...     | -           | x           | x       | + | -          | -          | -        |                        |
| 15. * <i>Grewia calophylla</i> ...          | ...     | -           | [x]         | -       | - | -          | -          | -        | ? Birds.               |
| * <i>Canarium enphyllum</i> ...             | ...     | -           | [x]         | -       | - | -          | -          | -        |                        |
| <i>Amoora Rohituka</i> ...                  | ...     | -           | x           | x       | x | -          | -          | -        | ? Birds.               |
| <i>Chiocrassia tabularis</i> ...            | ...     | -           | x           | [x]     | x | -          | -          | -        |                        |
| <i>Phlebocalymna Lobbiana</i> ...           | ...     | -           | -           | -       | - | -          | -          | -        |                        |
| 20. <i>Glyptopetalum calocarpum</i> ...     | ...     | -           | -           | [x]     | - | -          | -          | -        |                        |
| <i>Siphonodon celastrineus</i> ...          | ...     | -           | -           | [x]     | - | -          | -          | -        |                        |
| <i>Ventilago calyculata</i> ...             | ...     | -           | x           | x       | x | -          | -          | -        |                        |
| <i>Parishia insignis</i> ...                | ...     | -           | -           | [x]     | - | -          | -          | -        |                        |
| <i>Spondias mangifera</i> ...               | ...     | -           | x           | x       | x | -          | -          | -        |                        |
| 25. [ <i>Dracontomelum mangiferum</i> ] ... | ...     | -           | x           | x       | x | -          | x          | -        | ? Ocean.               |
| <i>Connarus gibbosus</i> ...                | ...     | -           | -           | [x]     | x | -          | -          | -        |                        |
| <i>Pueraria Candollei</i> ...               | ...     | -           | -           | x       | - | -          | -          | -        |                        |
| <i>Pueraria phaseoloides</i> ...            | ...     | -           | -           | x       | x | -          | -          | -        |                        |
| <i>Pterocarpus indicus</i> ...              | ...     | -           | x           | x       | x | -          | -          | -        |                        |
| 30. <i>Derris scandens</i> ...              | ...     | -           | x           | x       | x | x          | -          | -        |                        |
| <i>Mezoneuron enneaphyllum</i> ...          | ...     | -           | [x]         | x       | - | -          | -          | -        |                        |
| <i>Adenanthera pavonina</i> ...             | ...     | -           | -           | x       | x | -          | -          | -        |                        |
| <i>Acacia concinna</i> ...                  | ...     | -           | x           | x       | x | -          | -          | -        |                        |
| <i>Terminalia bialata</i> ...               | ...     | -           | -           | [x]     | - | -          | -          | -        |                        |
| 35. * <i>Lagerstroemia hypoleuca</i> ...    | ...     | -           | -           | [x]     | - | -          | -          | -        |                        |
| * <i>Lagerstroemia</i> sp. ...              | ...     | -           | -           | [x]     | - | -          | -          | -        |                        |
| <i>Illigera conyzadenia</i> ...             | ...     | -           | -           | [x]     | - | -          | -          | -        |                        |
| * <i>Webera Kurzii</i> ...                  | ...     | -           | -           | [x]     | - | -          | -          | -        |                        |
| <i>Randia longiflora</i> ...                | ...     | -           | -           | -       | x | x          | -          | -        |                        |
| 40. <i>Diplospora singularis</i> ...        | ...     | -           | -           | -       | x | x          | -          | -        |                        |
| <i>Ixora grandifolia</i> ...                | ...     | -           | -           | [x]     | x | -          | -          | -        |                        |
| <i>Ixora cuneifolia</i> ...                 | ...     | -           | -           | -       | - | -          | -          | -        |                        |
| <i>Strophanthus Wallichii</i> ...           | ...     | -           | x           | x       | - | -          | -          | -        | ? Wind.                |
| <i>Argyrea Hookeri</i> ...                  | ...     | -           | -           | -       | - | -          | -          | -        |                        |
| 45. <i>Argyrea lanceolata</i> ...           | ...     | -           | -           | [x]     | - | -          | -          | -        |                        |
| <i>Lettsomia peguensis</i> ...              | ...     | -           | -           | x       | - | -          | -          | -        |                        |
| <i>Porana spectabilis</i> ...               | ...     | -           | -           | [x]     | - | -          | -          | -        |                        |
| <i>Thunbergia laurifolia</i> ...            | ...     | -           | -           | x       | - | -          | -          | -        |                        |

| SPECIES.                              |     | Africa. | S. E. ASIA. |             |         |   | Australia. | Polynesia. | America. | Possibly <sup>n</sup><br>introduced<br>by |
|---------------------------------------|-----|---------|-------------|-------------|---------|---|------------|------------|----------|---|
|                                       |     |         | India.      | Indo-China. | Malaya. |   |            |            |          |   |
| <i>Strobilanthes phyllostachyus</i>   | ... | -       | -           | x           | -       | - | -          | -          | -        |   |
| 50. <i>Eranthemum album</i>           | ... | -       | [x]         | x           | x       | - | -          | -          | -        |   |
| <i>Peristrophe acuminata</i>          | ... | -       | -           | [x]         | x       | - | -          | -          | -        |   |
| <i>Brugantia tomentosa</i>            | ... | -       | -           | x           | x       | - | -          | -          | -        |   |
| <i>Loranthus longiflorus</i>          | ... | -       | x           | x           | x       | - | -          | -          | -        | ? Birds.                                  |
| <i>Phyllanthus columnaris</i>         | ... | -       | -           | x           | x       | - | -          | -          | -        |   |
| 55. <i>Cyclostemon assamius</i>       | ... | -       | -           | x           | -       | - | -          | -          | -        |   |
| <i>Aporosa villosula</i>              | ... | -       | -           | x           | -       | - | -          | -          | -        |   |
| <i>Croton sublyratus</i>              | ... | -       | -           | [x]         | -       | - | -          | -          | -        |   |
| * <i>Blachia andamanica</i>           | ... | -       | -           | [x]         | x       | - | -          | -          | -        | ? Ocean.                                  |
| <i>Claoxylon longifolium</i>          | ... | -       | -           | [x]         | x       | - | -          | -          | -        |   |
| 60 <i>Mallotus acuminatus</i>         | ... | -       | -           | [x]         | x       | - | -          | -          | -        |   |
| * <i>Mallotus andamanicus</i>         | ... | -       | -           | [x]         | x       | - | -          | -          | -        |   |
| <i>Cnesmone javanica</i>              | ... | -       | -           | x           | x       | - | -          | -          | -        |   |
| * <i>Livistona</i> sp                 | ... | -       | -           | [x]         | -       | - | -          | -          | -        |   |
| * <i>Corypha elata</i>                | ... | -       | -           | [x]         | -       | - | -          | -          | -        |   |
| 65. * <i>Calamus andamanicus</i>      | ... | -       | -           | [x]         | -       | - | -          | -          | -        |   |
| * <i>Calamus tigrinus</i>             | ... | -       | -           | x           | -       | - | -          | -          | -        |   |
| * <i>Alcocasia fornicata</i>          | ... | -       | x           | x           | x       | - | -          | -          | -        | ? Birds.                                  |
| <i>Scindapsus officinalis</i>         | ... | -       | x           | x           | x       | - | -          | -          | -        | ? Birds.                                  |
| <i>Dendrocalamus strictus</i>         | ... | -       | x           | x           | -       | - | -          | -          | -        |   |
| 70. * <i>Xylaria clavarioides</i> ... | ... | -       | -           | [x]         | -       | - | -          | -          | -        |   |

To the 67 unequivocal species of this list 3 other apparently local *Fungi* should perhaps be added; it is, however, extremely probable that when they are better known they will be found to exist elsewhere, in which case they might be added to the list of wind-distributed species; the proportion that results is therefore:—

Migrant sp: Remanent sp :: 4: 1.

It will be noted that not a single species which seems unquestionably "remanent" extends beyond South-Eastern Asia, and that the species which are here treated as such are only 67 in number, constituting no more than 20 per cent. of the flora. Of these species only 21, or 32 per cent., occur in India or Ceylon or both, and of these only one (*Sterculia villosa*) has not hitherto been found elsewhere to the east of the Sea of Bengal. This "remanent" section of the flora may therefore be looked upon as distinctly non-Indian. The point to be ascertained further is whether this element indicates more strongly an Indo-Chinese or a Malayan influence. Thirteen of the species, indicated in the table by an (\*) occur only in the Andamans or Nicobars, while seven more occur only in Tenasserim on the opposite shores of the Andaman Sea. But Tenasserim bears to the Malay Peninsula and Indo-China very much the

relationship that the Andaman-Nicobar chain bears to Indo-China and the Malay Archipelago, and perhaps neither it nor the Andamans ought to be spoken of as physiographically a part either of Indo-China or of Malaya;\* these 20 species cannot therefore be cited as indicating either an Indo-Chinese or a Malayan influence. The purely Indian *Sterculia villosa* must obviously be similarly excluded; there are therefore 21 species, or 32 per cent. of this group, that afford no evidence either way.

Of the remaining species, one-half, i. e., 23 species, or 35 per cent. of the whole, occur both in Indo-China and Malaya; these also give no evidence as regards this question. Of the other 23, 15 extend from Indo-China to these islands (some of them, like *Dendrocalamus strictus*, not going further than the Coco Group), without extending to Malaya; while only 8 extend from Malaya to these islands without occurring in Indo-China. The "remanent" species, therefore, so far as this evidence goes, indicate the predominance of an Indo-Chinese element, a fact that is altogether in accordance with what we should expect from our knowledge of the configuration of the sea-bottom along the line of islands from Cape Negrais in Arracan to the Nias Islands and Sumatra.

Reviewing the results of the preceding paragraphs we conclude that 288 species, or 80 per cent. of the flora, may conceivably have been introduced: 33 species, or 9 per cent., by human agency; 91 species, or 28 per cent., by birds; 60 species, or 17 per cent., by winds and 101 species, or 28 per cent., by the sea. We find moreover that the evidence is in favour of the bird-introduced species having, so far as those brought by wading- and water-birds are concerned, been introduced from the north, and so far as those brought by frugivorous and by seed- or grain-eating birds are concerned, having come in almost equal numbers from Malaya or the Andamans to the south, and from Indo-China to the north. So far as wind-introduced species are concerned the influence of the north-east monsoon is apparently the more active; so far as the sea-introduced species are concerned the influence of currents from Malayan seas to the south-east has been paramount.

The subjoined table gives a synoptic view of the probable origin of the Coco Island flora.

\* The writer has proposed the name "Malay Isthmus" for the conjoint area that includes Tenasserim, the Andamans and the Nicobars, and believes that it will be found convenient to recognise this as a distinct phytogeographical subdistrict. See *Ann. Roy. Bot. Garden, Calcutta*, iii, 238.



TABLE XXV. *Synopsis of origin of Coco Island flora.*

|   |     |
|---|-----|
| Species possibly introduced, for the presence of which no former land connection need be necessary:—  | 235 |
| Introduced by living creatures  | 127 |
| By human agency; (largely cosmopolitan species)   | 33  |
| Intentionally; (cultivated plants)  | 15  |
| Unintentionally; (weeds)  | 18  |
| By birds, (perhaps also to a small extent by bats)  | 94  |
| Attached externally to their bodies   | 25  |
| Immediately; (viscous- or prickly-fruited sp.)  | 9   |
| By mud; (species introduced by water-birds, mainly from the northward)  | 16  |
| Carried in crops of birds; (almost in equal proportion from northward and from southward)   | 69  |
| As a natural sequence of their mode of life; (fleshy-fruited species)   | 55  |
| Accidentally, where bird must have been destroyed to admit of germination of seeds; (by seed- and grain-eating birds): [indirectly due to agency of wind] | 14  |
| By other natural agencies   | 161 |
| By wind directly; (sp. with seeds specialised for wind-carriage; also small-spored <i>Cryptogams</i> )  | 60  |
| By the sea; (mainly Malayan species)  | 101 |
| Marine species; (mainly <i>Algae</i> )  | 21  |
| Littoral species; (mangrove-vegetation and beach-forest species)  | 80  |
| Species probably remanent and indicating former connection with adjacent land, (apparently Indo-China):—  | 70  |
| TOTAL of Coco Island species  | 358 |

*Notes on some native Ephemeridæ in the Indian Museum, Calcutta.—*

By THE REV. A. E. EATON, M. A., F. E. S., communicated by  
THE SUPERINTENDENT OF THE INDIAN MUSEUM.

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The following notes concern a collection of 27 specimens of *Ephemeridæ* received from Calcutta in April 1889, comprising representatives of 10 species or 6 genera, viz.:—3 sp. of *Palingenia*, 1 of *Polynitarceys*, 1 of doubtful genus allied to *Hexagenia*, 2 of *Ephemerella*, 1 of *Ephemerella* and 2 of *Epeorus*,—all of ordinary dimensions. From the absence of lesser species it may be inferred that these are the results of random

captures rather than of careful collecting. A series of 21 specimens from the Tenasserim valley, in Mr. McLachlan's collection, yields representatives of 9 species in 8 genera, all (except one) of small size, and some of them remarkably beautiful.

#### PALINGENIA LATA, Walker.

Seven adult ♂ specimens, labelled respectively "Sibs 2202 to 2211."<sup>1</sup> Their wings are in a very slight degree warmer in tint than the "light vandyke brown" of the typical specimens in the British Museum, and vary in unimportant detail from the wing-neuration, figured in Trans. Lin. Soc. London, 2nd series, Zool. iii. pt. i. 1 b (1884). Fore tarsus ♂ rather shorter than the tibia: joint 1 short, 2 or 5 the longest, 3 subequal to 4; unguis nearly of one length, each with a minute hook. For other particulars *vide op. cit.* p. 26. This is the only dark-winged species found hitherto in Hindostan.

The next two species have wings of a light colour.

#### PALINGENIA ROBUSTA sp. nov.

Two adult ♂ specimens labelled "Cachar;" both mutilated and perhaps faded. Wings defective, brownish white, dusky where bruised, their stronger nervures light, raw umber brown, the weaker nervures paler; neuration similar in style to that of *P. lata*, but with fewer and more distant veinlets distributed to the hinder half of the terminal margin. Head and notum light raw umber brown, the former blackish around the ocelli: pronotum varied with blackish or dusky markings comprising,—in front, an impressed sinuate transverse line ending opposite the middle of the backs of the eyes,—on each side, the border of a protuberance in front of the deep lateral depression,—behind a fine line along the transverse crease at the hind margin. Pleura, sternum, femora and fore tibia, dull, light yellowish brown (intermediate in tint between raw umber and brown ochre); fore tarsus and hinder tibia and tarsi paler, or duller in colour, and transversely rugose: a short dusky line on the mesopleuron, between the root of the costa and the spiracle. Dorsum faded: the last 3 or 4 segments largely suffused with light, raw umber brown, the anterior segments less and less so; the joinings sometimes pale. Venter and forceps dull, light, yellowish brown. Setæ dirty whitish yellow, uniformly pilose. Fore tarsus shorter than the tibia: joint, 1 short; 2 subequal to, or very little longer than 5, 3 shorter than 5 but subequal to 4; unguis nearly of one length. Hinder

<sup>1</sup> Presented to the Indian Museum by Mr. S. E. Peal, and collected in Sibsagar, Assam.

tarsi uni-unguiculate. Terminal jointlets of the forceps-limbs nearly of one length, or the last a little longer. Length of body 25 m. m.

POLINGENIA MINOR, sp. nov.

Three adult ♂ specimens much damaged by cabinet pests: 2 labelled "Karachi Mus." and 1 labelled "Nattor." Wings dull white, with sub-opaque neuratioſ; under a lense, in some lights, the cross-veinlets are bordered with milk-white. Neuratioſ fairly comparable to that of *P. ampla* (cf., Trans. Linn. Soc. London, 2nd Series, Zool. iii. pl. i. 1 c) but with the veinlets that end in the posterior half of the terminal margin shorter. Head brown ochre, blackish around the ocelli. Mesonotum light brown ochre, darker than the pronotum. Legs from some stand-points concolorous with the venter, the tarsi and hinder tibiæ shifting, with change of posture, to whitish. Colouring of abdomen effaced by pests, in the larger (Karachi) specimens; in the smaller (Nattor) one the dorsum is whitish ochre with whitish joinings anteriorly, but posteriorly is very light brown ochre, clouded in segments 6 and 7 to a small extent, and to a larger extent (half across the back), posteriorly in segments 8 and 9 with dark grey. Setæ extremely light brownish ochre in tint, uniformly pubescent. Fore tarsus little shorter than the tibia: joint 1 short, 5 rather longer than 2, 3 subequal to or little shorter than 2 and rather longer than 4; tibiæ and tarsi finely and transversely rugose. Terminal jointlets of the forceps-limbs of one length in the Nattor specimen, but in those from Karachi Mus. the last jointlet is rather the longer. Length of wing (Karachi exempl.) about 17, setæ about 50 m. m.

POLYMITARCYS sp.—

A single fragmentary ♀ of undescribed species, labelled "Raneeganj." In this genus discrimination is at present unsatisfactory owing to the meagreness of published descriptions. The specimen now under consideration differs from *P. indicus*, Pictet, in the colouring of the thorax and hinder legs. Whether his species can ever be identified is excessively doubtful in the absence of precise record of locality of capture. Reference to the "East Indies" as the domicile of an insect is of little use to any but the general reader.

Genus—(unascertainable).

One defective ♀ subimago labelled "Sibs. S. E. P.," lacking the fore legs and the last 3 segments of the body, and having the fore wings badly folded up out of shape. This insect, judging from the wings,

should be ranked as one of the *Ephemera* Type. The costal shoulder of the hind wings is rounded off obtusely, just as in *Hexagenia*, but the pronotum resembles that of a *Pentagenia*. Precise identification of the genus is precluded by the ruinous condition of the specimen.

Until now only three species of *Ephemera* have been described from India,—*E. immaculata*, Etn., from Cuna, *E. expectans*, Walker, from "Hindustan," and *E. supposita*, Etn., from Ceylon. Of these the first has no abdominal markings, but the others have linear dorsal and ventral markings. Two other species of Indian Mayflies, also, with linear markings, have long been represented by single specimens in Mr. McLachlan's cabinet; and in the present collection there is sufficient additional material for their description. They are nearly related to *E. supposita*, which therefore may advantageously be treated of in this paper, although wanting in the Calcutta Museum.

#### EPHEMERA SUPPOSITA, Eaton.

Described from ♀ subimago in Baron E. de Selys-Longchamps's Museum; 1 ♂ im. in McLach. Mus.; compared with the ♀ subim. standing with the type-specimen of *Potamanthus* [= *Atolophlebia*] *fasciatis* in Hagen's collection, and with ♂ specimens in the British Museum: cf. Trans. Linn. Soc. London, 2nd Series, Zool. iii. 73, pl. viii. 12° (1883) or [for pattern of dorsal markings] Trans. Ent. Soc. London, (1871) p. 75. The following notes are supplementary to these earlier descriptions of the ♂ imago.

Neuration of the forewing distinct to the unaided eye when held over white paper, with perhaps the exception of only the branchlets of the intercalar veins annexed to the apical nervure; over a dark background, when viewed under a lense facing the light, the radius and the stronger parts of the subcosta of the forewing, and the cross veinlets in both wings remain dark, but the other nervures become pale; in transmitted light the nervures assume an amber tint. Membrane of the forewing (excepting the distinctly coloured parts) perfectly transparent in direct view: but held obliquely at a moderate distance, fronting the light, the finer of the longitudinal nervures transmit to it a faint yellowish grey; or pointing towards the light, the cross veinlets transmit to it a faint reddish grey: in proximity to the costa, the pterostigmatic portion of the marginal area is rather deficient in colour. I was probably mistaken in 1883 when I described the dorsal vessel as  $dx\ k$ ; but the ravages of cabinet pests preclude certitude on this point.

The dorsal abdominal markings of the best marked segments comprise six black longitudinal stripes or streaks united to one another by the burnt umber brown apical border of the segments,—three on each

side of the back. In segments 9 to 7 two of the streaks, linear and subparallel with each other, lie close together beside the dorsal vessel, extending the whole length of the segment (the outer streak is rather broader than the other), while the third streak lies apart from them close by the pleuron. In the more anterior segments (e. g., in the 3rd segment) the main trachea in front of the spiracle is dark, and the three streaks, in mutual contact at the apical margin, constitute a tripartite marking: the streak nearest to the dorsal vessel becomes abbreviated and subulate but the other two combining either in the form of a V or as a pair of conjugate triangular streaks, extend nearly to the base of the segment. In the first segment, a quadrangular spot seems to be substituted for the streaks: the 9th ventral segment is bilineate lengthwise.

Terminal jointlets of the forceps-limbs short for an *Ephemera*; the last of them smaller, but little if at all shorter than the penultimate. The figure of 1883, cited above, is exact, and correctly leaves their proportions in the dried insect uncertain. Penis lobes subcylindrical. The admeasurement of setæ of ♀ im. stated in 1871 [*cf. E. faciata*] was spurious, being based upon a specimen of the next species, referred to in 1883 with an expression of doubt as to identity of the species.

*Hab.* Rainbodde, Ceylon.

EPHEMERA REMENSA, sp. nov.

Five ♂ imagos labelled "Kulu  $\frac{6942\cdot4, \& \cdot6, \& \cdot8}{1}$ ," in Indian Museum;

and 1 ♀ imago labelled "Musuri," 7,000 ft., June, Long, in McLach. Mus.

Imago (dried) ♂.—Genitalia similar to the ordinary European pattern in this genus: the last jointlet of the forceps-limb rather shorter than the penultimate. A pair of very broad black stripes, diminishing a little in breadth anteriorly, extend from the tip nearly to the base of the 9th ventral segment and end abruptly: the other ventral segments are bilineate longitudinally, excepting the first segment which is unmarked. Neuration of the fore wing distinct to the naked eye throughout (over white paper) excepting the branchlets of the intercalar veins annexed to the anal nervure, and the base-ward extremities of the longitudinal nervures posterior to the radius: under a lense, the portions thus visible, and the neuration of the hind wing, from certain stand-points only, appears of a uniform light pitch brown, but in most positions the finer of the longitudinal nervures acquire a brown amber tint, the stronger neuration and the cross veinlets remaining pitch brown or changing to pitch black. Wings transparent, tinted distinctly with very light raw umber grey throughout, with markings of raw umber brown. The markings of the fore wing comprise the submarginal area

together with the extremity of the area next behind it, and narrow cloudy bordering along the subcosta in front and the radius behind (the former more extensive in the beginning of the pterostigmatic space) as well as along the cross veinlets; in-addition to spots: in this sex the spots are larger than in the ♀ (but not much larger) and therefore are hardly so small as in *E. supposita*; the best marked are three in the usual positions in the midst of the wing, viz:—one at the præbrachial fork and the others on the cubitus and the first sector, but occasionally cross veinlets or the ends of nervures are clouded in the usual places of other spots found in species of *Ephemeræ*, such as at the inner ends of the shortest of the sectorial intercalar nervures, or at the junction of the pobrachial with the 2nd or 3rd cross veinlet beyond the fork of the præbrachial nervure, or near the base of the wing between the pobrochial and anal nervures either on the nearest cross-veinlet or at the extremity of the foremost intercalar nervure. The terminal margin of the hind wing is narrowly bordered with a light, raw umber grey cloud and several of the cross veinlets are pitch black.

The abdominal markings resemble those of *E. supposita* in most respects: those of the 1st segment are not well shewn in the specimens at hand: the 2nd segment in place of dorsal streaks has on each side an irregular transverse quadrangular blotch, narrowed upwards and obliquely truncate above; the 3rd to the 5th segments have two streaks and the 6th to the 8th segments three dorsal streaks on each side, all longitudinal and sub-parallel, the lowest of which is linear and narrow, the next to it double the width and usually more curved, and the innermost (where there are three) narrow and tapering at both ends. In the 9th segment a broad stripe takes the place of the lowest and the intermediate streak combined. On the pleura, in nearly every segment, is a short black dash at the base; but the 10th segment has a black blotch. Setæ light raw umber brown; the joinings mostly (excepting in the basal half of the median seta) narrowly dark brown. Fore femur in opaque view either raw-umber brown or rufo-piceous: tibiæ dark pitch brown; tarsus lighter; trochanter and coxa subochreous. Hinder legs in opaque view, translucent yellow ochre, with the obtuse claw pitch brown. In transmitted light, the fore femur and tarsus become ferrugineous amber, and the hinder legs yellow amber.

♀ Very similar to the ♂. Thorax brown ochreous, with a black spot in front of each tegula, a black longitudinal stripe on each side of the pronotum, and a black irregular line down the outer side of the fore coxa. Fore femur brown ochreous; fore tibiæ bistre brown or light pitch brown; fore tarsus paler. Wings nearly colourless, with indistinct and minute spots, placed singly at the base of the sub-costa, behind

that on the cubitus, and at the fork of the præbrachial; another further out on the pobrachial; and one near the base of the fore wing at the commencement of the next intercalar vein. Hindwings spotless or with spots only faintly indicated.

Length of body ♂ 15, ♀ 18; wing ♂ 13-15, ♀ 21; setæ ♂ im. 26 & 28 to 30 & 34 m. m.

EPHEMERA CONSORS, sp. nov.

Two ♂ imagos labelled "Kulu  $\frac{5854}{5}$  and  $\frac{5855}{5}$ ," and two ♀ subimagos labelled "Kulu  $\frac{5852}{5}$  and  $\frac{5853}{5}$ " in the Indian Museum; and 1 ♀ subimago labelled "Sikkim, 4,000 feet, 7 [i. e., July] 80, H. J. Elwes, in McLach. Mus."

Subimago (dried) ♀.—Wings transparent, very faintly tinted with extremely light brown ochreous grey, or in the sub-marginal area of the fore wing with very light amber, with a small, blackish grey spot at the fork of the præbrachial nervure, another at the bulla of the sub-costa, and single greyish dots nearly in a straight line with them on the sector and cubitus of the fore wing. Hind wing spotless. Neuration of the fore-wing distinct to the naked eye (over white paper) from the costa to the sector, and then hardly discernible onwards to the pobrachial nervure: after that the minor neuration and the neuration of the hind wing cannot be distinguished. When magnified, the neuration of the hind wings and of the greater portion of the fore-wing is opaque and concolorous with the membrano: but many of the cross veinlets in the basal half of the wing shift in colour to piceous in certain postures, and all of them (excepting the greater cross-vein) anterior to the sector are pitch black. The pronotum is marked as in *E. remensa*, with a small oval black spot anteriorly on each side in a furrow: and in both species there is a small acute triangular black spot in front of the posterior coxa.

Imago (dried) ♂.—Terminal jointlets of forceps proportionally longer than in *E. remensa*, and more slender; the last jointlet shorter than the penultimate in the dried specimen: basal joint relatively short. Venter bilineate lengthwise interruptedly in the posterior segments: the lines are narrow and as far apart from each other in the 9th as in the preceding segments, and in the 5th, 4th and perhaps the 3rd segments become greatly abbreviated or even reduced to dots; but the 2nd and 1st segments are spotless. Wings much as in the ♀ subimago, but of course more transparent: the spots in the fore wing are similar but less distinct; the greater part of the neuration is (in opaque view) light raw umber brown changing (in transmitted light) either to brown-

ish amber or (in the finer parts) to very light or whitish amber; but where visible without a lense, the cross veinlets when magnified appear pitch black or pitch brown in opaque view, and this colour remains fairly constant from most stand-points; the subcosta and radius and also in some positions the great cross vein are likewise piceous. Hind wing spotless, and clear throughout. Fore leg raw umber brown; blackened at the tip of the femur and at the base and tip of the tibia. ~~H~~inder legs light yellowish amber colour.

Abdomen pale ochraceous or whitish raw umber grey in the first 5 segments, and light brownish ochre in the hinder segments, marked with black lines and streaks disposed mainly in two longitudinal series: segment 1, spotless; segment 2, with a faint dot near the base on each side of the dorsal vessel, and a larger spot below the dot just above the main trachea, which spot is not represented in the other segments; in segments 3 to 9 the markings corresponding with the said dots take the forms of an oval spot in the 3rd segment, an abbreviated tapering streak in the 4th, a tapering streak produced to the hind margin in the 5th segment, and apparently continuous lines from the 6th to the 9th segment. Venter marked longitudinally, in segments 3 to 5 with two abbreviated tapering streaks; in segments 6 to 8 with two thin tapering lines; and in segment 9 with two linear stripes. Setæ ochraceous, with opaque joinings.

Dorsum of ♀ in segments 3 to 6 longitudinally bilineate, with an additional black line on each side in segments 7 to 9 parallel with and exterior to the principal lines in the hinder  $\frac{3}{4}$  of each segment: on the pleura of most of the segments is a short marginal streak at the base, and a longer streak just inside the margin near the tip; on each side of the 2nd segment is an erect spot like a mark of exclamation. Hind wing spotless; neuration indistinct to the naked eye.

Length of body 12; wing ♂ 12, ♀ 15–21; setæ ♀ subim. about 17 m. m. The specimens are infested with encysted parasites.

EPEMERELLA sp.—

One ♀ subimago labelled "Kulu  $\frac{5852}{5}$ ."

EPEORUS PSI, Eaton.

*Epeorus psi*, Etn., Trans. Linn. Soc., 2nd Ser. Zool. iii. 242 (1885).

Two ♀ subimagos labelled "Kulú" respectively. The larger specimen measures:—wing 24, setæ about 35 m. m.

EPEORUS sp.—

One subimago labelled "Kulu  $\frac{5849}{5}$ ."









